

Initial Environmental Examination Report

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Bangladesh: Paramount Solar Power Project

PART 1: Main Report

Prepared by Dynamic Sun Energy Private Limited for the Asian Development Bank (ADB).

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**Initial Environmental Examination (IEE)
of
100MW AC Solar Power Park
of
Dynamic Sun Energy Pvt. Ltd.
at
Pabna, Bangladesh**



Prepared for: Dynamic Sun Energy Pvt. Ltd.

Prepared By:



Adroit Environment Consultants Ltd (AECL)



ROAD # 16 SECTOR # 07, UTTARA MODEL TOWN, DHAKA-1230, BANGLADESH.

CELL: +880 1711-565728, +880 1733376609-10, TEL: +88029116712, +88029116713,

E-MAIL: aecldhaka@gmail.com, eia.aecl@gmail.com, WEB: www.aecl-bd.org

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ABBREVIATION

ADB	Asian Development Bank
AECL	Adroit Environment Consultants Limited
Aoi	Area of Influence
ARIMA	Acquisition and Requisition of Immovable Property Act 2017
ASA	Action for Social Advancement
BAT	Best Available Technologies
BBS	Bangladesh Bureau of Statistics
BDT	Bangladesh Taka (Currency)
BMD	Bangladesh Meteorological Department
BNBC	Bangladesh National Building Code
BOD	Biochemical Oxygen Demand
BOO	Build, Own and Operate
BPDB	Bangladesh Power Development Board
BMD	Bangladesh Meteorological Department
BNBC	Bangladesh National Building Code
BRAC	Bangladesh Rural Advancement Committee
BWDB	Bangladesh Water Development Board
CO	Carbon Monoxide
CO ₂	Carbon Dioxide
COD	Chemical Oxygen Demand
COP	Conference of Parties
CSR	Corporate Social Responsibility
dBA	Decibels A
DMP	Disaster Management Plan
DO	Dissolve Oxygen
DoE	Department of Environment
DSEPL	Dynamic Sun Energy Private Limited

EBRD	European Bank of Reconstruction and Development
ECA	Environment Conservation Act 1995
ECC	Environmental Clearance Certificate
ECOP	Environmental Code of Practice
ECR	Environment Conservation Rules 2023
EHS	Environment, Health and Safety
EMS	Environmental Management System
EPC	Engineering, Procurement and Construction
EIA	Environmental Impact Assessment
ESMP	Environmental and Social Management Plan
FGD	Focus Group Discussion
GoB	Government of Bangladesh
GRC	Grievance Redress Committee
IA	Implementation Agreement
IEE	Initial Environmental Examination
IFC	International Finance Corporation
ILO	International Labour Organization
IUCN	International Union for Conservation of Nature
JICA	Japan International Cooperation Agency
KII	Key Informant Interviews
kV	Kilo Volt
LC	Least Concern
LRP	Livelihood Restoration Plan
MOEFCC	Ministry of Environment, Forest, and Climate Change
MOWR	Ministry of Water Resources
MoU	Memorandum of Understanding
MSDS	Material Safety Data Sheets
MW	Mega Watt
NEMAP	National Environmental Management Action Plan
NGO	Non-Government Organization
NOx	Oxides of Nitrogen

PAPs	Project Affected Persons
PPE	Personal Protective Equipment
PM _{2.5}	Particulate Matter < 2.5µm
PM ₁₀	Particulate Matter < 10µm
PWD	Public Works Datum
RIC	Resource Integration Centre
RRP	Resettlement and Restoration Plan
SAP	Sampling and Analysis Plan
SDGs	Sustainable Development Goals
SEDA	Sustainable Energy Development Agency
SO ₂	Oxides of Sulfur
SPARRSO	Bangladesh Space Research and Remote Sensing Organization
SPM	Suspended Particulate Matter
SPS	Safeguard Policy Statement
SREDA	Sustainable and Renewable Energy Development Authority
STP	Sewage Treatment Plant
TDS	Total Dissolve Solid
TOR	Terms of Reference
TSS	Total Suspended Solids
UNFCCC	United Nations Framework Convention on Climate Change
WARPO	Water Resources Planning Organization
WB	World Bank

GLOSSARY

Adverse impact: An impact that is considered undesirable.

Ambient air: Surrounding air.

Aquatic: Growing or living in or near water.

Bangla: Bengali language.

Baseline (or existing) conditions: The 'baseline' essentially comprises the factual understanding and interpretation of existing environmental, social and health conditions of where the business activity is proposed. Understanding the baseline shall also include those trends present within it, and especially how changes could occur regardless of the presence of the project, i.e., the 'No-development Option'.

Beneficial impacts: Impacts, which are desirable and useful.

Biological diversity: The variety of life forms, the different plants, animals and microorganisms, genes they contain and the ecosystems they form. It is usually considered at three levels: genetic diversity, species diversity and ecological diversity.

Char: Char a tract of land surrounded by the waters of an ocean, sea, lake, or stream; it usually means, any accretion in a river course or estuary.

Contractor: The legal entity that is party to and performs a works contract, the other party to the contract being the "Procuring Entity."

Ecosystem: A dynamic complex of plant, animal, fungal and microorganism communities and associated non-living environment interacting as an ecological unit.

Emission: The total amount of solid, liquid, or gaseous pollutant emitted into the atmosphere from a given source within a given time, as indicated, for e.g., in grams per cubic meter of gas or by a relative measure, upon discharge from the source.

Endangered species: Species in danger of extinction and whose survival is unlikely if the existing conditions continue to operate. Included among those are species whose numbers have been reduced to a critical level or whose habitats have been so drastically reduced that they are deemed to suffer from immediate danger of extinction.

Environmental effects: The measurable changes, in the natural system of productivity and environmental quality, resulting from a development activity.

Environmental Impact: An estimate or judgment of the significance and value of environmental effects for natural, socio-economic, and human receptors.

Environmental and Social Management Plan (ESMP): A Plan to undertake an array of follow-up activities which provide for the sound environmental and social management of a project/ intervention so that adverse environmental impacts are minimized and mitigated; beneficial environmental and social effects are maximized; and sustainable development is ensured.

Environmental Management: Managing the productive use of natural resources without reducing their productivity and quality.

Erosion: Process in which wind and water removes materials from their original place; for instance, soil washed away from an agricultural field.

Evaluation: The process of looking back at what has been really done or accomplished.

Fauna: A collective term denoting the animals occurring in a particular region or period.

Flora: All the plants found in each area.

Guccha Gram: Normally known as "Clustered Village" is a Shelter Project of GoB dedicated for landless and homeless people to maintain uninterrupted flow of necessary credit through informal groups for implementation of productive activities.

Habitat: The natural home or environment for a plant or animal.

Household: A household is identified as a dwelling unit where one or more persons live and eat together with common cooking arrangement. Persons living in the same dwelling unit having separate cooking arrangements constitute separate household.

Khal: A natural creek, pool, or tank with a passage of inflow and outflow of water which relates to a nearby river or waterbody.

Land use: Types include agriculture, horticulture, settlement, pisciculture and industries.

Literacy: It denotes ability to write a letter in any language. Literacy status assessment is made for population 7 years and over.

Mitigation: An action, which may prevent or minimize adverse impacts and enhance beneficial impacts.

Mauza: A Bangla word for the smallest government administrative area corresponding to village revenue unit.

Mahalla: Lowest urban geographic unit having identifiable boundaries.

Negative Impact: Negative change from the existing situation due to the project.

Public consultation: A range of techniques that can be used to inform, consult, or interact with stakeholders affected / to be affected by a proposal.

Stakeholders: Those who may be potentially affected by a proposal, e.g., Local people, the proponent, government agencies, NGOs, donors and others, all parties who may be affected by the project or to take an interest in it.

Taka: Unit of Bangladeshi currency.

Terrestrial: Living on land like forests, grasslands, deserts, shorelines, and wetlands.

Union: Smallest unit of local self-government comprising several villages.

Upazila: Sub-district name. Upazila introduced in 1982.

Village: Lowest rural geographic unit either equivalent to a mauza or part of a mauza.

Ward: Smallest administrative urban geographic unit comprising of mahallas and having ward council institution.

Zila: Bengali word of district.

EXECUTIVE SUMMARY

1. INTRODUCTION

Electricity plays the most basic role in the economic growth through sustainable structure as well as poverty eradication and security of any country. Reliable electricity supply is a vital issue for the world today. Future economic growth crucially depends on the long-term availability of electricity, which are affordable, available and environment friendly. The present government's goal is to guarantee continuous and quality power supply for all by 2027 through change in generation, transmission, and distribution methods.

The present government's goal is to generate 40% electricity from renewable and clean sources by 2041 as Bangladesh is a signed country of United Nations Framework Convention on Climate Change (UNFCCC) which targets to reach net zero emission by 2050. Currently, the country has only 1183.63 MW renewable energy installed capacity where, 949.64 MW is solar energy according to Sustainable and Renewable Energy Development Authority (SREDA). Presently, 40 solar power plant projects are being incorporated, among them 10 are already in operation, 8 are on construction phase and 22 are under planning phase. GoB is requesting the business magnets of the country to invest in Solar Power Plants to fulfil the target of sustainable clean energy across the land.

Responding to the need and goal of the country, Dynamic Sun Energy Pvt. Ltd. planned the proposed 100 MW AC Solar Power Park which is in the village of Bhabanipur in the Hemayetpur Union which is situated at the south-west side of Pabna City, in Pabna District, Bangladesh. The project is planned on a Build, Own, and Operate (BOO) basis under the Implementation Agreement (IA) with the Government of Bangladesh (GoB). The proposed main power plant requires 400 acres of land [for the main power plant, substation area, worker camp, construction / laydown area]. At the time of data collection for this assessment, the proponent had purchased 229 acres of land through willing buyer and willing seller method with the rest of the land under process with anticipated acquisition completion date within September 2023. The electricity transmission line for this power plant has started from the proposed solar power plant (Bhabanipur, Hemayetpur Union) to existing 230/132 KV Grid PGCB Sub-station at Joynagar, Ishwardi, Pabna which is 21.5 km long and contains 79 towers. The width of the RoW has been considered as 10m along the TL and allowable height clearance is 8m from lower conductor. The transmission tower footings require 0.7642 acres of land which is purchased through negotiated settlement. Because land may be accessed through legal means if the land owner refuses access involuntary resettlement requirements are triggered according to ADB SPS 2009, Safeguard Requirement 2. At the time of data collection, footing areas for 76 towers had been purchased with 3 transmission tower footing areas pending. The assessment of prior project activities undertaken to date are covered in the allied Environmental and Social Compliance Audit Report (ESCAR) which is required by ADB under its provisions for financing projects with existing facilities.

Under this project, AECL has been appointed for providing consultancy service for conducting Environmental & Social Assessment by preparing IEE report, Environmental and Social Compliance Audit (ESCA) and Resettlement Plan (RP) / Livelihoods Restoration Plan (LRP) for the solar power plant, transmission line, and its associated facilities. This report only deals with the Environmental & Social Assessment for the solar power plant, transmission line, and its associated facilities which has been

prepared according to the ToR provided by the ADB to assess the impacts of the power plant and its associated facility in the surrounding area of the plant and suggest appropriate avoidance, mitigation, and management.

2. LEGISLATIVE REQUIREMENTS

According to the latest Environmental Conservation Rules, ECR 2023 the proposed project and its associated facilities falls under “ORANGE Category” as more than 50MW Solar power plant and Transmission line less than 25 km falls under “ORANGE Category”. According to ECR, 2023, this project falls under “Orange” category and is required to obtain ‘Site Clearance Certificate’ by undertaking IEE study prior to any kind of construction activities at the project site. DSEPL has submitted an IEE study conducted by DSCL in September-October, 2023. The report was submitted to DoE in March 2023 (Submission copy is attached as Annexure 1). After few revisions the report was approved and SCC was provided (Certificate No.: 23-100875, valid from June 19, 2023 to June 18, 2024) in June 2023 against the final version of the IEE. The copy of SCC is attached as Annexure 2. This clearance is subject to renewal every year.

According to the Environmental categorization of ADB Safeguard Policy Statement (SPS) 2009, the proposed project is a “**Category B**” project which has few site impacts which can be mitigated and managed via mitigation measures. According to the ADB SPS 2009, “**Category B**” project requires an Initial Environmental Examination (IEE) per the requirement of ADB to assess the impacts of the project. This IEE study has been undertaken to comply with the ADB Safeguard Policy Statement (SPS). According to the Involuntary Resettlement categorization of ADB Safeguard Policy Statement (SPS) 2009, the project is categorized under “**Category B**”, as land acquisition for the transmission line may have recourse to eminent domain type legislation in the event of failed negotiations with land holders which may, as a result lead to involuntary restriction on land use and economic displacement as result of lost or damaged crops and trees. For this a Resettlement Plan has been developed and implemented for any remaining land acquisition that occurs for the transmission line development. According to the indigenous people categorization of ADB Safeguard Policy Statement (SPS) 2009, this project falls under “**Category C**”, as there is no sign of indigenous people in or around the project site.

In addition to ADB’s SPS 2009 requirements, the applicable national and international policies, laws, rules, and guidelines, are followed for the preparation of this IEE study and are briefly discussed in this chapter 2.

3. DESCRIPTION OF THE PROJECT

Dynamic Sun Energy Private Ltd.is setting up the 100 MW ac solar power plant at Hemayetpur Upazila which will supply electricity to Bangladesh Power Development Board (“BPDB”) for a period of 20 years on an off-take basis.

Table 1: The Basic Data of 100 MW ac Solar Power Project

1. Name of the Project	100 MW ac Solar Power Plant
2. Project Proponent	Dynamic Sun Energy Private Limited

3. Project Location	Bhabanipur & Ratanpur Mauza, Hemayetpur Union, Pabna Sadar Upazila, Pabna, Bangladesh
4. Fuel Type	Sunlight
5. Plant Type	Solar Power Plant
6. Net Plant Capacity	100 MW
7. No. of Solar PV Module	2,74,224 nos.
8. No. of Grid Tied Inverter	760 nos.
9. No. of Transformers	Total 36 nos.
10. Total Land Area	400 acres for power plant ¹ 0.7642 acres for tower footing area
11. Transmission line	21.5 km from Hemayetpur to Ishwardi
12. Transmission tower	79 nos.
13. Total Manpower	Construction phase: 700 persons (200 residential and 500 non-residential) Operation phase: 550 persons (200 residential and 350 non-residential), see Annexure 5
14. Water Requirement	Construction phase: Domestic purpose 86 m ³ /day Operation phase: Domestic purpose 71 m ³ /day and PV module cleaning (twice) 2742 m ³ /month
15. Power Evacuation System	Generated electricity will be evacuated through BPDB's 230/132 kV substation situated at Joynagar, Ishwardi, Pabna.

The proposed Power Plant is located within Bhabanipur and Ratanpur Mauza; Hemayetpur Union, Pabna Sadar Upazila, Pabna. Power transmission line will pass over Bhabanipur, Bhagiratpur, Bilkeda Khas, Khas Char Bagunda, Char Pratappur, Char Kudulia, Shimul Char, Ratanpur Mouza of Pabna Sadar Upazila and Dadapur, Joynagar, Kamalpur, Kaikunda, Maniknagar, Luxmikunda, Sahapur and Char Silimpur Mouza of Ishwardi Upazila. The project site is about 8.79 km from Pabna Sadar Upazila and 125.87 km from Dhaka. The project area is surrounded by a branch of Padma River at south and west side. Bhabanipur Upazila is located at the north side and Ghoshpur on the east side.

Power Plant Area

The project site is in Bhabanipur which is mainly a char land², at the side of the Padma River. There is no industry and factory around the project site. A khal originated from the Padma River is located adjacent to the southern side boundary of the project site and 0.5 km away from the west side boundary of the project. There is a guchha gram at the north-west side of the project area. The width of this khal varies from 100m to 130m. During monsoon season the local khal has very low flow but during dry season it becomes dry. Padma River is passing to the south side of the project area which is about 1.5 km from the project site.

¹ The project needs around 379 acres of land based on its design and drawings, however, BPDB approved around 400 acres of land. In revised FM, the Sponsors consider Land & Land Development Costs for 379 acres.

² Char is a tract of land, surrounded by the waters of an ocean, sea, lake, or stream; it usually means, any accretion in a river course or estuary.

According to the layout map (Figure 1 and Annexure 2) there will be office buildings, main substation control building, block sub-station building within the project area. Dormitory building, family quarter, swimming pool, playground, officer's club, child park, mothers' waiting zone, mosque, helipad will be at east side of the project area.

During the time of preparation of this report (March 2023) the project was under construction phase and already construction of sub-station building, office building, dyke or boundary road, pile driving work etc. are going on. There are temporary office buildings, labour shed, medical room, child care facility, kitchen, dining, sanitation facility, septic tank, water treatment plant, parking area, internal earthen road etc. facilities present at the site. Existing temporary office buildings and labour shade has been shown in the layout in **Figure 3.7**. 3D view of the project is shown in **Figure 3.8**.

According to the site elevation map (attached as Annexure 3) the highest elevation of the power plant site is 13.162m and lowest elevation is 7.487m. According to the Flood Study and Mitigation Report (attached as Annexure 4), the maximum water elevation for 10-year and 100-year ARI due to overtopping of Padma River is EL. 13.98 m PWD and EL.15.04 m PWD respectively and maximum water elevation for 100-year ARI due to flood from local rain is EL.12.3 m PWD. The entire land has already been developed. To raise the main power plant site at elevation 12.3m total 71555 m³ sand was required where 67591 m³ was procured from cutting of the main power plant site. Additional 3964m³ was outsourced. In addition to that, 50300 m³ (36575m³ + 13725 m³) was outsourced for platform development of substation and main control room and 156522 m³ (135966 m³ + 20556 m³) was outsourced for dyke and internal road development. In total, 210786 m³ sand was outsourced. Please see Annexure 33 & 34. Project proponent has distributed the project area into 15 Blocks. The solar panel will be mounted on tables and each table will be mounted on 10 PHC piles. 58 PV panels will be mounted per single table. There will be a total of 4728 tables and 48600 PHC piles. About 10775 piles out of 48600 have already been driven. About 5.6 m of the pile will be driven below the ground and 3.4 m will be above the ground. The elevation of lower and upper side of the PV panel will be at 15.485m and 16.50m respectively. Some solar panel has been installed in a trial basis to identify the yield of them in developed land. The project site is a vacant land with no settlements, but a small area is currently in use for banana cultivation for only this season. Fencing of 258.5 acres has been completed. The project solar power plant site is located on non-agricultural Char land and the proponent has already purchased 229 acres of land till August 2023 through willing buyer and willing seller method and the rest of the land is under process which will be purchased by end of September 2023 according to the latest schedule.

Transmission Line Area

The length of the transmission line is 21.5km and the transmission line from the power plant area will be strung above the ground through transmission towers and toward the last end (near substation) about 0.5 km will go under the ground. Memorandum of understanding (MoU) has been made with the land owners for the land area of the transmission tower and compensation has been given to the project affected people for Row, standing crops and for access to the site. The construction of tower footing area has been started and out of 79 transmission towers (only footing) 75 had been completed by August 2023. The proponent has entered a JV with DRS-EPBL-Mukti for transmission line construction activity. They are using cast in situ piles for transmission tower base. There will be two

types of towers i.e., angle tower and suspension tower. For each angle tower 8 piles are casted and for each suspension tower 16 piles are casted for the construction of footing of the towers. Construction of angle tower footing takes 7~10 days and suspension tower footing take 4~5days. After completing the construction of each tower footing, the contractor cleans up and reinstate the site before leaving. During the construction of tower footing the DSEPL ensures environmental and social compliance by their two-tier mechanism. The first tier involves site supervisors and EHS manager who observes contractor's compliance to environmental and social issues and the second tier involves audit team who monitors whether the site supervisors and EHS manager is properly working or not. They reporting is maintained through a WhatsApp group and no written reporting is there. The contractors are required to confirm compliance with national labour laws as part of their contract agreement which is attached as Annexure 9. In the responsibility section of the Contract, it is mentioned that the contractor must follow the EHS Policy of DSEPL which is prepared following Bangladesh Labour Act. EHS Policy of DSEPL attached as Annexure 10. The adjacent land area of the transmission line is predominantly agricultural type. After Commissioning of the 132kV Transmission Line, Power Grid Company of Bangladesh (PGCB) will be responsible for operation & maintenance of the transmission Line. DSEPL will be responsible for coordination & liaison with PGCB's O & M team to ensure uninterrupted power evacuation from the DSEPL Solar Power Plant.

The layout of power plant area and project boundary area are shown in **Figure 1** (Annexure 2) and **Figure 2**.

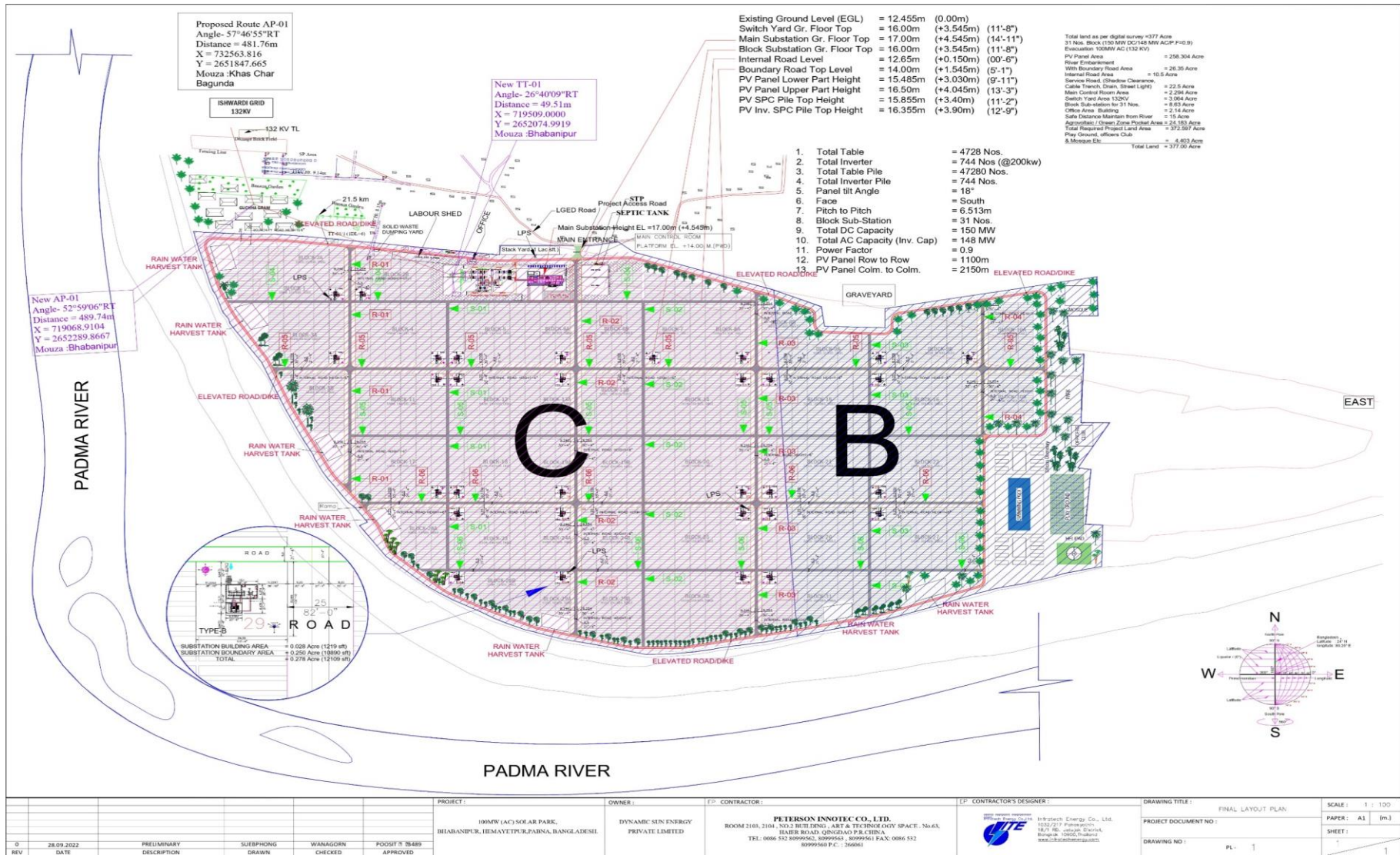


Figure 1: Layout of 100 MW Solar Power Plant Area

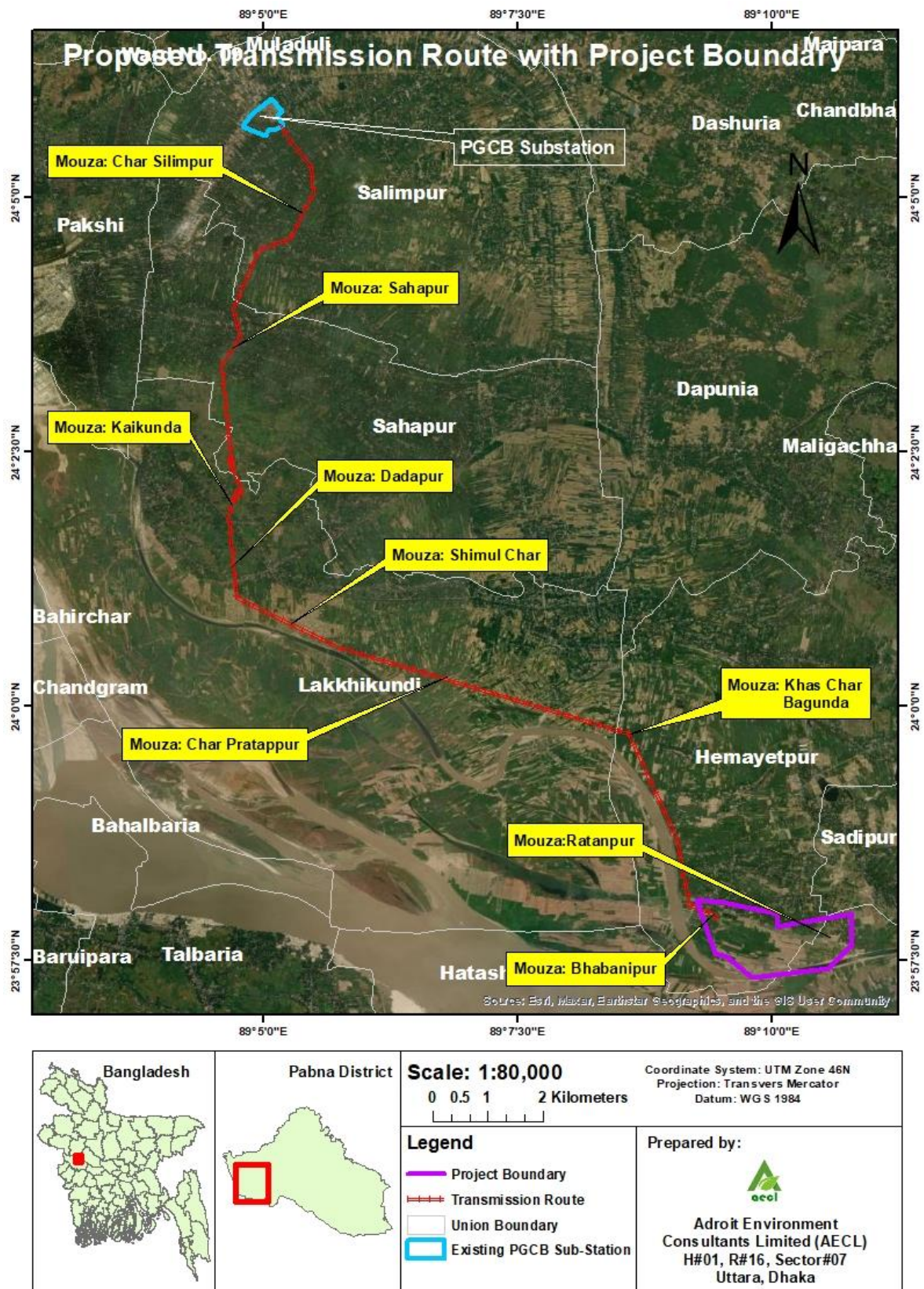


Figure 2: Project Location Map

4. BASELINE ENVIRONMENT

Baseline environment is concerned with existing physical, chemical, and biological conditions of the area where the project is going to be set up. The surface water, ground water, soil quality, ambient air quality and noise level have been analyzed to evaluate the primary baseline of the area. In addition to that, primary traffic count, ecological data, land use data has been collected, secondary data on meteorology, geology, hydrology, natural disasters, socio-economic data have been collected.

❖ Climate

Bangladesh is located in the tropical monsoon region, and its climate is characterized by high temperature, heavy rainfall, often excessive humidity, and fairly marked seasonal variations. January is the coolest month, and April is the warmest. Most rains occur during the monsoon (June-September) and a very little occurs in winter (November-February). According to the Climate map, the project area falls in **North-western zone (D)**.

Meteorological data was collected from Bangladesh Meteorological Department. According to it, the monthly average Dry Bulb Temperature (maximum) ranges from 28.5°C to 30.0°C during monsoon season, 16.4 to 22.3 °C during winter season and 24.4 to 30.3 °C during summer season. Average Monthly Relative Humidity (maximum) ranges from 80-85% at monsoon season, 75-79% at winter season and 65-75% at summer season. The maximum Monthly Average Rainfall is recorded 150-400 mm at monsoon season, 0-20 mm at winter season and 5-200 mm at summer season. The monthly prevailing wind speed is recorded 2.1-2.9 SE at monsoon season, 2-2.5 NW at winter season and 1.9-2.6 NW at summer season.

❖ Ambient Air Quality:

Air monitoring has been conducted at six different locations (4 within power plant area and 2 along the transmission route for 24 hours). The baseline levels for criteria pollutants i.e., PM2.5, PM10, SPM, SO₂, NO₂ and SO₂ are compliant with DoE standard. Among the four locations, the maximum values of PM2.5, PM10, SPM, SO₂, NO_x, CO were found to be 33.52 µg/m³ (location 2), 65.73 µg/m³ (location 1), 105.84 µg/m³ (location 1), 13.83 µg/m³ (location 2), 11.49 µg/m³ (location 2) and 2 ppm (location 3) respectively. These maximum values are well within the permissible limits of the DOE and IFC standards.

❖ Ambient Noise:

The ambient noise level data were collected from six locations within the project area and the transmission route. The highest noise level out of them was found in the 5th location at 44.1 (LAeq) dBA (during daytime near Dadapur Purba para along the transmission route), which is within the permissible limits of the DOE standards.

❖ Soil

Most of the area of Bangladesh is a vast, low-lying alluvial plain, sloping gently to the south and southeast. According to Bangladesh Agricultural research council's Agro-Ecological Zoning map [Figure 4.26 (a)], the project area falls in High Ganges River Floodplain. This region includes the western part of the Ganges River floodplain which is predominantly highland and medium highland. Most areas have a complex relief of broad and narrow ridges and inter-ridge depressions. The upper parts of high ridges stand above normal flood level. Lower parts of ridges and basin margins are seasonally shallowly flooded. General soil types predominantly include calcareous dark grey floodplain soils and calcareous brown floodplain soils. Organic matter content in the brown ridge soils is low but higher in the dark grey soils. Soils are slightly alkaline in reaction. General fertility level is low. Soil sample was collected from the project site and the test result is provided in Table 4.23.

❖ Surface Water Quality:

The primary data for surface water quality parameters was collected from two different locations (one from Padma River and another from the adjacent khal) and the quality of the water has been analyzed and found satisfactory.

❖ Groundwater Quality:

To determine quality of ground water, water sample was collected from nearby tube wells and analyzed for different parameters. The result shows that all the parameters, except Lead (Pb) and Cadmium (Cd) remain within the allowable limits of drinking water value as per as Environmental Quality Standards for Bangladesh.

Ground water is used for drinking purpose during construction phase and they have treatment facility at site for that. The depth of the current tube well at project site is 70 ft. As a result, the water exceeds guiding value for Pb and Cd. DSEPL has set up new submersible pump at 220 ft depth along with water treatment plant which can treat 1000 litres of drinking water per hour for the supply of drinking water for the rest of the construction period and operation phase ahead. (Water sample testing results are attached as Annexure but the test results for Pb and Cd is yet to be received from the laboratory) pH, Colour, Turbidity, Total Hardness, Cl, TDS, Mn, As, Fe, TC, parameters are well within Bangladesh and WHO drinking water standards)

❖ Traffic Study

Traffic volume around the project site has been studied on 16th May, 2023. The traffic volume counts have been recorded continuously for 24 hours to assess the peak hour traffic and traffic composition. The traffic survey data shows that even during full-fledged construction phase the traffic flow is way less than saturation condition. The details of the traffic survey are presented in Section 4.7.

❖ Seismicity:

Based on distribution of earthquake epicenters and morpho-tectonic behavior of different tectonic blocks Bangladesh has been divided into three generalized seismic zones. This essentially means that Zone I is the most severe and Zone III is the least severe in seismic hazard. According to the Earthquake Zoning Map of Bangladesh (BNBC 2020), the project area falls in seismic **Zone II** where seismic intensity is Moderate and seismic zone coefficient (Z) is 0.2.

❖ Flood:

The project area falls in moderate to low river flooding area shown in **Figure 4.33**. Padma River is on the south side of the project site which is around 1.5km from the project site. According to the local people, the project area and the area between the Padma River and the project area is not seasonally flooded every year. Observing the maximum and minimum water level data from the year 1950 to 2019, it is found that the maximum highest level was 14.53m, minimum highest level was 13.09 and the danger level is considered as 14.53m. The proponent has already undertaken a flood study and has designed the project accordingly so that during flood the project does not get hampered due to water level rise. Details of flood study report and consideration of flooding in project design has been discussed in Section 3.8.1.

❖ Socioeconomic Baseline:

The Proposed Power Plant is in Pabna Sadar upazila, Pabna district which further comes under Rajshahi Division. Pabna is a district in North-western Bangladesh. The proposed Power Plant is located within Bhabanipur and Ratanpur Mauza; Hemayetpur Union, Pabna Sadar Upazila, Pabna. Power transmission line will pass over Bhabanipur, Bhagiratpur, Bilkeda Khas, Khas Char Bagunda, Char Pratappur, Char Kudulia, Shimul Char, Ratanpur Mouza of Pabna Sadar Upazila and Dadapur, Joynagar, Kamalpur, Kaikunda, Maniknagar, Luxmikunda, Sahapur and Char Silimpur Mouza of Ishwardi Upazila.

Pabna Sadar is the largest upazila of Pabna; occupies an area of 439.30 sq. km. It is located between 23°53' and 24°05' north latitudes and between 89°09' and 89°25' east longitudes. The upazila is bounded on the north by Atgharia upazila, on the east by Santhia upazila and Sujanagar upazila, on the south by Pangsha upazila of Rajbari zila and Khoksha upazila and Kumarkhali upazila of Kushtia zila and on the west by Ishwardi upazila.

For this project, land of the main power plant area has been purchased following willing buyer and willing seller process and there were no informal land users who would have been involuntarily displaced, nor any structures been displaced. In addition to that, there was no informal land user, land sellers / users who will be worse off as a result of the land sale / loss. Involuntary resettlement is triggered for land acquisition along TL for transmission tower footing area. There is no informal land user or any structure along the TL route. Transmission Line runs mostly through agricultural land. So, there is no village along that route. A detailed survey of all the affected HH due to this Power Plant and TL has been conducted to establish the socio-economic conditions of the households within the power plant and TL, to identify

project impacts and their mitigating/management measures. Findings of the primary socio-economic survey of the affected HH is provided the sections 4.17.1 & 4.17.2.

Table 2: Demographic Characteristics of the Pabna Sadar Upazila

Upazila	Pabna Sadar
Total Area (Sq. km)	439.30
Total Household	1,38,439
Total population	6,15,468
Male	3,09,227
Female	3,06,241
Average Household	4.21
Literacy rate (%)	51.4
Sex ratio (M/F)	101
Population Density (Per Sq. km)	1345
Municipality	1
Union	10
Mouza	243
Village	291
Ward	15
Mahalla	46

(Community Report: Pabna, 2011)

A total of 1054 households (HHs) comprises of 3693 people has been surveyed for the purposes of the social assessments for the main power plant site. Of these HHs 97.55% are male headed and 2.53 female headed HHs are found during census period. 214 HHs have only 1-2 members. HH size of within 7 to 8 members was minimal in the area. According to the age band, the most prominent group is 30-60. At project area total of 3693 populations were surveyed where 2118 are male and 1575 are female, which represents that percentage of female population in the project area is less compared to the male population. It is found that 65.12% people are married against 34.88% unmarried or widowed. Islam is the predominant religion in the study area. Primary and secondary level education entrance is high in the area. A variety of occupational choices have been found in the project location, and majority are farmer. Female population are mostly employed in agriculture and husbandry sector. In addition to agriculture, the other significant occupations are involvement with business, service, day labor, service, and mason etc. In transmission line area, 74.19% of general households have got the facility of drinking tube well water, 1.43% tap water and the remaining 24.38% household gets water from other sources. 67.27% of general household use sanitary facility, 31.50% non-sanitary latrine and 1.23% have no toilet facility. According to Rural Electrification Program, a total of 73.50% of the survey households in transmission line area reported to have electricity connection.

A total of 79 households (HHs) comprises of 257 people has been surveyed for the purposes of the social assessments for the TL only. Of these HHs 100% are male headed. 14 HHs have only 1-2 members. HH size

of within 7 to 8 members was minimal in the area. According to the age band, the most prominent group is 30-60. At project area total of 257 populations has been surveyed where 142 are male and 115 are female, which represents that percentage of female population in the project area is less compared to the male population. It is found that 66.15% people are married against 33.85% unmarried. Islam is the predominant religion in the study area. Primary and secondary level education entrance is high in the area. A variety of occupational choices have been found in the project location, and majority are farmer. Female population are mostly unemployed and do not undertake unpaid labour activities outside of the HH. In addition to agriculture, the other significant occupations are involvement with business, service, day labour, service, doctor, and mason etc. In transmission line area, 92.04% of general households have got the facility of drinking tube well water, 4.1% tap water and the remaining 3.86% household gets water from other sources. 67% of general household use sanitary facility, 27.6% non-sanitary latrine and 4.3% have no toilet facility. According to Rural Electrification Program, a total of 68.7% of the survey households in transmission line area reported to have electricity connection.

❖ Terrestrial Ecology & Aquatic Ecology (flora & fauna)

During the field visit on and from 15th – 16th April, 2023 and 14th – 17th August, 2023, different kinds of flora such as Papaya (*Carica papaya*), Kachu (*Colocasia esculenta*), Bamboo (*Bambusa bambus*), Palm Tree (*Borassus flabellifer*), Coconut (*Cocos nucifera*), Kachuripana (*Eichhornia crassipes*), Helencha (*Enhydra fluctuans*) etc. were found during the AECL field visit.

Common Toad (*Bufo melanostictus*), House Lizard (*Hemidactylus brookii*), Common Kingfisher (*Alcedo atthis*), Common Myna (*Acridotheres tristis*), House Sparrow (*Passer domesticus*), House mouse (*Mus musculus*), Domestic Cow (*Bos Taurus*), Domestic Goat (*Capra aegagrus hircus*) etc. terrestrial fauna was found during the field visit. Ilish (*Tenulosa ilisha*), Shol (*Channa striatus*), Shing (*Heteropneustes fossilis*), Rui (*Labeo rohita*), Freshwater Shrimp (*Macrobrachium rosenbergii*) etc. aquatic fauna were found during AECL field survey.

According to the field survey, there is no critical and natural habitat present in and around the project area. Few aliens' invasive flora i.e., Eucalyptus and water hyacinth, some alien invasive fauna i.e., grass carp and silver carp are present in and around the project area. List of existing flora and fauna are mentioned in **Table 4.50 – Table 4.54** and they all fall under least concern category according to IUCN. Any endangered, vulnerable, or threatened faunal species were not found during the field visit around the main power plant area as well as transmission line area. There are some nocturnal animals around the project site, but their movement will not be hampered as the construction work will not be undertaken at night time. According to our study *Pteropus giganteus* (Indian Flying Fox) was found in the study area. But the population of them was not significant, it was rarely common and there is no large roost of them. According to a study (Hasan, M. K., Feerez, M. M., Datta, A. K., Saha, A., & Ahmed, T. (2014). Indian flying fox (*Pteropus giganteus*) roosts in north Bengal of Bangladesh.) *Pteropus giganteus* (Indian Flying Fox) roosters are not present in the Pabna District.

5. ENVIRONMENTAL & SOCIAL IMPACTS OF THE PROJECT

Major impact during pre-construction phase is acquisition of land for power plant and transmission line, disruption of earth surface and disturbance to the local ecology due to land development work.

Major impact during construction phase may include air pollution due to constructional activity and movement of vehicles. Noise generated from moving and idling vehicles, construction activity and movement of heavy machinery may cause hearing problem and create sudden panic to the adjacent people. Surface water quality deterioration due to dumping of solid waste may occur if not managed properly. Soil and ground water may be polluted by accidental spillage of waste lubricants from machineries and leaching from PV panels. Possibility of occurring accidents due to lack of safety and security, not using proper PPE, spread of several contagious and infectious diseases. Spread of contagious diseases due to unhygienic condition in labor shed. Beneficial impact is employment opportunity will be generated during construction.

The major impacts during operation phase may include air and noise emission from transformer and sub-stations. There might be leaching from faulty PV panels which will affect the soil and ground water quality if not timely mitigated. Leakage of electricity may take place which may cause occupational hazard to the cleaners. The main impact during operation phase will be due to usage of ground water for sanitation and kitchen purpose. In addition to that due to influx of residential officials and workers significant amount of solid waste and sewage waste will be generated. If they are not treated and discharged properly then it may cause several vectors (mosquito, flea) borne diseases (diarrhea, dysentery). There is possibility of occurring accidents and spread of several transmittable and infectious diseases among community people. Transmission line may pose potential hazards such as electrocution, bird electrocution etc.

Impact evaluation and identification has been presented in **Table 5.1**

6. PREDICTION, EVALUATION AND MITIGATION MEASURES OF IMPACTS

After evaluating the impacts and their effects on the surroundings, mitigation measures should be taken thoroughly to keep the environment less harmful and hazard free. In **chapter 6**, mitigation measures are suggested for the project proponent and contractor to ensure safety and security to the environment and social surroundings. Mitigation measures suggested has also been incorporated in the Table 3.

7. ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP)

In the context of a project, Environmental & Social Management Plan (ESMP) is concerned with the implementation of the measures necessary to mitigate the adverse impacts and to enhance beneficial impacts. 10. A table (Table 7.1) incorporating all mitigation measures has been prepared for quick access. In addition to that Waste Management Plan, Labour Management Plan, Labour Accommodation Plan, Occupational Health & Safety Plan, Green belt development program, 3R policy, Corporate Social

Responsibility (CSR), ESMP implementation team, Cost of ESMP implementation, Contingency plan, Institutional Capacity building, ESMP monitoring and review has been discussed in detail in **Chapter 7**.

8. MONITORING, EVALUATION AND REPORTING

Monitoring programs have been proposed for this project, which include visual and analytical monitoring during both construction and operation phase. The objective of this monitoring program is to ensure that the various tasks detailed in the environmental and social management plan, particularly the mitigation measures are implemented in an effective manner, and to evaluate project's impacts on the key environmental and social parameters. The total estimated cost of monitoring would be around BDT 11,00,000.00 yearly during construction and BDT 860,000.00 yearly during operation respectively. Monitoring plan during construction and operation phase are described below in **Table 4 to Table 7**.

Table 3: Monitoring Plan during Construction Phase of the Project (Visual)

Issue	Key aspects	Monitoring Frequency	Responsibility
Traffic volume	Incoming & outgoing traffic, traffic movement records	Monthly	DSEPL
Site Security	Proper fencing, isolation of site from general access, marked passage for workers and visitors	Quarterly	
Personal Protective Equipment	Ensure every single person involved in the construction activity wear proper PPE	<ul style="list-style-type: none"> daily inspection by supervisors weekly/ monthly inspection by manager/ engineers 	
Incident record & reporting	Documented record of all incident, accident and its remedial process.	Quarterly	
Solid waste	Quantity of solid waste, segregation, disposal process and transfer	Quarterly	
Access to medical facility	Check access to medical facility with contracted hospital and first aid facility at site	Quarterly	
Grievance Redress Mechanism	Any significant complaint from External (neighbours) and Internal (workers) and their remedial procedure	<ul style="list-style-type: none"> Monthly for internal Monthly on Community GRM 	
Safety orientation & training of workers	Frequency of training & orientation of workers for safety	Quarterly	

Issue	Key aspects	Monitoring Frequency	Responsibility
Sanitation & drinking water facility to workers	Availability of safe drinking water and it's quality, septic tank/wastewater disposal and sanitation facility to the workers	Quarterly	
	Septic tank/wastewater disposal, outlet characteristics and sanitation facility to the workers		
Chemical Storage and Management	Fuel tank and chemical storage operation, maintenance and leakage inspection	Monthly	
Hazardous Waste Storage	Storage area condition, availability of spill kit, inventory	Monthly	
Site Drainage	Maintaining proper drainage	Quarterly	
Occupational Health and Safety	Daily inspection on PPE usage	Daily for PPE usage	
	Review of implementation records of specific high-risk procedures (including photos)	Weekly inspection of transmission tower construction safety	
	Inspection of transmission tower construction contractor safety performance against OHS plan Documented record of all incident, accident and its remedial process	Monthly for others	
Community Health and Safety	Site inspection of implementation of the described measures	Weekly site inspection	
	Review of community GRM records	Monthly on community GRM	
Terrestrial Habitat	Implementation status of the mitigation measures	Quarterly	
Aquatic Habitat	Implementation status of the mitigation measures	Quarterly	
Labor and Working Condition	Implementation status of the mitigation measures	Quarterly	
Social acceptability of Construction workers to the host communities	Implementation status of the mitigation measures	Quarterly	
Employment Generation	Implementation status of the mitigation measures	Quarterly	

Issue	Key aspects	Monitoring Frequency	Responsibility
Increase in local business	Implementation status of the mitigation measures	Quarterly	

Table 4: Monitoring Plan during Construction Phase of the Project (Analytical)

Issue	Parameters	Applicable Standards	Monitoring Locations	Monitoring Frequency	Responsibility
Ambient Air Quality	SO ₂ , NO _x , CO, SPM, PM ₁₀ and PM _{2.5}	Air Pollution (Control) Rules 2022 (Schedule-1) & IFC EHS Guideline, 2007	Given in Table 4.17	Once in 3 months	DSEPL and implemented by 3 rd party consultant
Noise level	Noise at different locations at day and night	Noise Pollution (Control) Rules 2006 (Schedule-1) & IFC EHS Guideline, 2007	Given in Table 4.19	Once in 3 months	
Soil	pH, Cd, Cr, Pb, Zn, Al, Cu, Ni, and Si	World Health Organization (WHO) (1996) Permissible Limits of Heavy Metals in Soil and Plants.	Given in Table 4.23	Once in 6 months	
Surface water	Temperature, pH, TDS, TSS, DO, BOD, COD, EC, Fe, Cr, Pb, Cd, Zn, Al, Cu, Ni, Sulphate, Nitrate, and Phosphate.	Environment Conservation Rules (ECR) 2023 (Schedule-2 (Ka)(1)) and & IFC EHS Guideline, 2007	Given in Table 4.12	Once in 6 months	
Ground water	Usage (volume), and quality in terms of Temperature, pH, TDS, As, Hardness, Cr, Pb, Alkalinity, Fe, Cd, Sulphate, Zn, Al, Phosphate, Cu, Ni, Nitrate, TC, and FC.	Environment Conservation Rules (ECR) 2023 (Schedule-2 (Kha)) and & WHO Drinking Water Guidelines	Given in Table 4.14	Once in 6 months	
Drinking water	Temperature, pH, TDS, As, Hardness, Cr, Pb, Alkalinity, Fe, Cd, Sulphate, Zn, Al, Phosphate, Cu, Ni, Nitrate, TC, and FC.	Environment Conservation Rules (ECR) 2023 (Schedule-2 (Kha)) and & WHO Drinking Water Guidelines	Given in Table 4.16 (a), 4.16 (b)	Once in 3 months	

Issue	Parameters	Applicable Standards	Monitoring Locations	Monitoring Frequency	Responsibility
Waste water (Septic tank outlet)	pH, BOD5 at 20°C, COD, Total Nitrogen, Total Phosphorus, Oil and Grease, TSS, TC	ECR 2023 (Schedule-3), WB EHS guidelines for treated sanitary sewage discharge	2 Outlet of 2 Septic tank	Once in 3 months	

Table 5: Monitoring plan during Operational Phase of the Project (Visual)

Issue	Key aspects	Minimum Monitoring Frequency	Responsibility
Hazardous Waste	Review hazardous waste inventory, Check and document PV module that leaches in an inventory, Storage area condition, availability of spill kit, inventory monthly	Monthly	DSEPL
Traffic volume	Incoming & outgoing traffic, traffic movement records	Once in 6 months	
Site Security	Proper fencing, isolation of site from general access, marked passage for workers and visitors	Once in 6 months	
Personal Protective Equipment	Ensure every single person involved in the construction activity wear proper PPE	<ul style="list-style-type: none"> daily inspection by supervisors weekly/ monthly inspection by manager/ engineers 	
Incident record & reporting	Review the documented record of all incident, accident and its remedial process.	Monthly	
Solid waste	Monthly inspection of waste collection and storage areas, review of waste inventory and monitor final disposal location	Monthly	
Access to medical facility	Check access to medical facility with contracted hospital and first aid facility at site	Once in 6 months	
Grievance Redress Mechanism	Any significant complaint from External (neighbours) and Internal	<ul style="list-style-type: none"> Monthly for internal Monthly Community GRM 	

Issue	Key aspects	Minimum Monitoring Frequency	Responsibility
	(workers) and their remedial procedure		
Safety orientation & training of workers	Review implementation of training & orientation of workers for safety	Monthly	
Sanitation & drinking water facility to workers	Drinking water quality against Environment Conservation Rules (ECR) 2023 (Schedule-2 (Kha)) and IFC EHS Guideline, 2007 Sewage treatment plant output sampling against ECR 2023 (Schedule-3), WB EHS guidelines for treated sanitary sewage discharge once in 3 months	Quarterly	
Chemical Storage and Management	Fuel tank and chemical storage condition and operation, maintenance and leakage inspection	Quarterly	
Site Drainage	Maintaining proper drainage	Quarterly	
Water inventory	Review water usage record, Make an inventory of water usage (groundwater and rainwater) and wastewater discharge	Monthly	
Occupational Health and Safety	Daily inspection on PPE usage Review of implementation records of specific high-risk procedures (including photos) Proper fencing, isolation of site from general access, marked passage for workers and visitors, Documented record of all incident, accident and its remedial process, OHS training records & orientation of workers for safety	Daily for PPE use Monthly for Others	
Community Health and Safety	Site inspection of implementation of the described measures Review of community GRM records	Weekly site inspection Monthly on community GRM	
Labor and Working Condition	Implementation status of the mitigation measures	Quarterly	

Issue	Key aspects	Minimum Monitoring Frequency	Responsibility
Terrestrial Habitat	Implementation status of the mitigation measures	Quarterly	
Aquatic Habitat	Implementation status of the mitigation measures	Quarterly	
Social acceptability of workers to the host communities	Implementation status of the mitigation measures	Quarterly	
Employment Generation	Implementation status of the mitigation measures	Quarterly	
Social and Economic Enhancement around project area	Implementation status of the mitigation measures	Quarterly	

Table 6: Monitoring plan during operational phase of the Project (Analytical)

Issue	Parameters	Applicable Standards	Monitoring Locations	Monitoring Frequency	Responsibility
Ambient Air Quality	SO ₂ , NO _x , CO, SPM, PM ₁₀ and PM _{2.5}	Air Pollution (Control) Rules 2022 (Schedule-1) & IFC EHS Guideline, 2007	Given in Table 4.17	Once in 6 months	Project company by 3 rd party consultant
Noise level	Noise at different locations at day and night	Noise Pollution (Control) Rules 2006 (Schedule-1) & IFC EHS Guideline, 2007	Given in Table 4.19	Once in 6 months	
Soil	pH, Cd, Cr, Pb, Zn, Al, Cu, Ni, and Si.	World Health Organization (WHO) (1996) Permissible Limits of Heavy Metals in Soil and Plants.	Given in Table 4.23	Once in 6 months	
Surface water	Temperature, pH, TDS, TSS, DO, BOD, COD, EC, Fe, Cr, Pb, Cd, Zn, Al, Cu,	Environment Conservation Rules (ECR) 2023 (Schedule-2 (Ka)(1)) and &	Given in Table 4.12	Once in 6 months	

Issue	Parameters	Applicable Standards	Monitoring Locations	Monitoring Frequency	Responsibility
	Ni, Sulphate, Nitrate, and Phosphate.	IFC EHS Guideline, 2007			
Ground water	Temperature, pH, TDS, As, Hardness, Cr, Pb, Alkalinity, Fe, Cd, Sulphate, Zn, Al, Phosphate, Cu, Ni, Nitrate, TC, and FC.	Environment Conservation Rules (ECR) 2023 (Schedule-2 (Kha)) and WHO Drinking Water Guidelines	Given in Table 4.14	Once in 6 months	
Drinking water	Temperature, pH, TDS, As, Hardness, Cr, Pb, Alkalinity, Fe, Cd, Sulphate, Zn, Al, Phosphate, Cu, Ni, Nitrate, TC, and FC.	Environment Conservation Rules (ECR) 2023 (Schedule-2 (Kha)) and WHO Drinking Water Guidelines	Given in Table 4.16	Once in 3 months	
Wastewater	pH, BOD5 at 20°C, COD Total Nitrogen, Total Phosphorus, Oil and Grease, TSS, TC	ECR 2023 (Schedule-3), WB EHS guidelines for treated sanitary sewage discharge	2 Outlets of STPs	Once in 3 months	

9. ALTERNATIVE ANALYSIS

Bangladesh is facing the scarcity of electricity for many years. After the implementation of this project additional 100 MW electricity will be incorporated in national grid, which will be delivered to different industries, factories, offices nationwide. Moreover, the socio-economic condition of the project site will be developed. 'No build' alternative will not bring these huge changes and other benefits to the socio-economic condition of the adjacent project area. Considering the overall scenario, it is concluded that the 'No build' alternative is unacceptable, and the potential socio-economic benefits of implementation of such project far outweigh the adverse impacts, all of which can be controlled and minimized to an allowable level.

The power plant requires a huge amount of land, which will be bought from the local people following willing buyer and willing seller method and at GoB approved rate. The project is in construction phase right now and the proponent has already bought 229 acres of land and the rest of the land is under process. There is also no alternative land for the proposed project right now as the location of the main power plant site was pre decided by the Bangladesh Power Development Board (BPDB) (attached as Annexure 22) while providing LOI for the said project and the TL route was finalized by Power Grid Company of Bangladesh (PGCB) (attached as Annexure 23) by conducting survey to find out the most suitable route. If the project chooses to relocate then it will be too expensive for the proponent to buy another land and develop the overall project. So, the selected location of 100 MW ac Solar Power Plant is quite expectable for the proposed project from environmental point of view.

Moreover, the fuel of the power plant is the most environment-friendly fuel. Fuel alternatives and technology alternatives have been also discussed in detail in Chapter 9 and the proposed project detail has been found more reliable and acceptable from environmental and social perspectives. The technology being offered by Dynamic Sun Energy Private Limited is considered to be state of the art in terms of being environment friendly, energy efficiency and modern plant & process design. The plant will be built according to the applicable Best Available Technologies (BAT) defined for similar plants.

10. EMERGENCY RESPONSE AND DISASTER MANAGEMENT PLAN

➤ **Emergency response plan**

Under the supervision of the Project company, all plant personnel will have responsibilities assigned to them during emergency. The documented responsibility will be included in a program manual which can constitute a part of the plant's operation manual. Compliance with the responsibilities should be monitored and if these are not carried out for any reason, corrective measures should be taken.

There should be trained emergency response teams, specific contingency plans, and specific equipment packages in place to cope with these types of emergencies. In case of an emergency incident occur, immediate action must be taken to mitigate the impacts. Details discussed in **Chapter 10**.

➤ **Disaster management plan**

Appropriate management plan should have to be taken by the project operator to prevent any unwanted disaster in the plant as per the suggestion made in **chapter 10**. In this regard, there should be a provision to stop the production immediately during any process failure or disaster.

11. RISK ASSESSMENT AND MANAGEMENT

Risk estimation and evaluation is a part of the process which aims at identifying all the potential hazards, exposure to hazardous condition or hazards, and their mitigation or safety measures. The approach of risk evaluation is in combination of qualitative and quantitative evaluation of hazard sources, exposures,

consequences, and possible mitigation measures. Risk assessment and safety measures are suggested **Chapter 11.**

Potential hazard during construction stage might include occupational related hazards i.e., trips, falls, electrocution, accidents etc. During operation phase, potential hazard might include leaching from PV panels, fire hazards due to mechanical failure and human toxicity. Other hazards might include occupational related hazards, fatal accidents etc. Mitigation measures include: careful handling and checking of PV panels to avoid leaching, use of personal protective equipment (PPE); proper training on health and safety and safety equipment; proper training on how to use machineries and tools for construction; regular checkup of instruments and machineries; awareness on personal hygiene and road traffic rules and regulation; monthly health inspection of workers and staff etc.

12. STAKEHOLDER CONSULTATION

Stakeholder consultations are very important and sensitive issues for setting up a new power plant in any area of Bangladesh. Three types of consultation were carried out which are Focus Group Discussion, Key Informant Interviews and Formal Public Consultation. Local people, fishermen, farmers, women, children, and vulnerable groups were communicated during the focus group discussion. Govt. offices of Pabna Sadar Upazila and Pabna District, such as, DoE, Department of Fisheries, Department of Agricultural Extension, Bangladesh Water Development Board, UNO and Upazila Parishad, officials were reached during the key informant interviews. Throughout these meetings a simple, non-technical, description of the project was given, with an overview of the project's likely human and environmental impact.

On 17th May 2023, a Formal Public Consultation program was organized by DSEPL and AECL, where local people, political leaders, govt. officials, project proponents along with the Environmental and Social Consultants Team of AECL joined. The stakeholder consultations were initiated with an open objective to ensure people's participation right from the planning stage of the project. More specially, this was aimed at improving the study considering opinions from the people of the impacted area. The consultation process was carried out in the Bangla languages. During these meeting a simple, non-technical, description of the project was given, with an overview of the project's likely human and environmental impact. The community consultations demonstrated that goodwill towards the project proponents indeed exists; approval for project activities by the communities was evident as it would create employment opportunity for skilled, semi-skilled and unskilled people. Implementation of this project would also enhance the region's standard of living because of the increased generation of electricity, contributing to further industrial set up (which further leading to more employment opportunities), etc. Some constructive suggestions were given by the concern personnel for the betterment and protection of the environment.

On 17th August 2023, 2nd Formal Public Consultation program was organized by DSEPL and AECL, where project affected people, project labourers, political leaders, govt. officials, project proponents along with Environmental Consultants Team of AECL joined. The aim of this consultation was to present the identified impacts and the ESMPs, highlighting how the concerns of the communities and stakeholders from previous consultations were addressed in the IEE and ESMP and so that stakeholders can convey

their valuable opinions on the process to date and any additional comments. The consultation process was carried out in Bangla language. Land owners who already transferred the land ownership of the main power plant site confirmed that they have received their payments. Land owners of the tower footing area also received money according to the MoU prior to the initiation of the construction work. Local people are happy about the project as they perceive the opportunity to work on the project and manage to increase the standard of their living. They are also happy as the local business has improved as DSEPL buys their daily necessary things from nearby shops and markets. Local people praised the company as they have improved road quality from Pabna Sadar Upazila to Bhabanipur. Details are provided in **Chapter 12**. The Project will also develop a Stakeholder Engagement Plan which will ensure the company has a structure for regular and ad hoc engagement with stakeholders throughout the project cycle.

13. GRIEVANCE REDRESS MECHANISM (GRM)

The Project Management will establish a procedure to answer to project-related queries and address complaints and grievances about any irregularities in application of the guidelines adopted for assessment and mitigation of environmental safeguards impacts. There will be two types of GRM, one is for internal workers and officials and the other one is for community or affected people. The complaints related to construction and plant operation that may create inconveniences to agency/individual should be addressed based on consensus, the procedure will help to resolve issues/conflicts amicably and quickly without resorting to expensive, time-consuming legal actions. To ensure impartiality and transparency, hearings on complaints will remain open to the public. A Grievance Redress Committee (GRC) will be created and they will record the details of the complaints and the reasons that led to acceptance or rejection of the particular cases. The ToR of GRM has been incorporated in Annexure 20. The GRC will keep records of all resolved and unresolved complaints and grievances and make them available for review as and when asked for by appropriate authority and any organizations known to be working with urban development issues. However, it should be noted that the GRC process will not pre-empt and aggrieved person's right to seek redress in the courts of law. Details provided in **Chapter 13**.

14. CONCLUSION AND RECOMMENDATIONS

The proposed power plant will supply uninterrupted power to national grid after the successful implementation. The proposed power plant will use renewable energy which reduces greenhouse gas emissions by providing carbon-free electricity generation, contributing to cleaner air and a healthier planet. The abundance and renewable nature of solar energy ensures its availability for generations to come, promoting long-term sustainability. The integration of solar power plants into existing electricity grids enhances grid stability and resilience.

The benefits of solar power plants, extend beyond environmental considerations. They encompass economic growth, job creation, energy security, and a cleaner, healthier future for all. Bhabanipur and Ratanpur Mauza are two remote places of Pabna Sadar Upazila with undeveloped roads and socio-economic facilities. After the implementation of the project, it will create employment opportunity to the

local people and improve transportation system in the project area, which will ultimately play an important role in poverty reduction and develop social safety condition.

Though there are few negative impacts due to the implementation of the project but it has been designed to comply with the country's environmental laws and regulations especially on, air emissions, ambient air quality, wastewater effluent, and noise. The project management has taken steps to ensure that the plant will also meet the social compliance guideline. Given the management measures and monitoring commitments by the Dynamic Sun Energy Private Limited for the project, environmental and social impact of the project will be manageable. By embracing renewable energy sources and investing in solar power plants, we can pave the way toward a more sustainable and resilient energy system, addressing the challenges of climate change and advancing toward a greener and brighter future.

1 INTRODUCTION

1.1 Background

Power is the main driving force of current progress and the foundation of the growth rate. The vision of Bangladesh Government is to give access power to all by the year 2027 and in accordance with this present government's goal is to ensure continuous and quality power supply for all by 2027 through change in generation, transmission, and distribution methods. To fulfill the Government's plan, BPDB has come up with a comprehensive plan which envisages around 25,840 MW new generation addition by 2027. (BPDB, 2021-22).

The present government's goal is to generate 40% electricity from renewable and clean sources by 2041 as Bangladesh is a signed country of United Nations Framework Convention on Climate Change (UNFCCC) which targets to reach net zero emission by 2050. Currently, the country has only 1183.63 MW renewable energy installed capacity where, 949.64 MW is solar energy according to Sustainable and Renewable Energy Development Authority (SREDA). Presently, 40 solar power plant projects are being incorporated, among them 10 are already in operation, 8 are on construction phase and 22 are under planning phase. GoB is requesting the business magnets of the country to invest in Solar Power Plants to fulfil the target of sustainable clean energy across the land.

Responding to the need of the country, Dynamic Sun Energy Pvt. Ltd. planned the proposed 100 MW ac solar power project which is in the village of Bhabanipur in the Hemayetpur Union which is south-west outskirts of Pabna City, in Pabna District, Bangladesh. The project is planned on a Build, Own, and Operate (BOO) basis under the Implementation Agreement (IA) with the Government of Bangladesh (GoB). The proposed main power plant requires 400 acres of land [for the main power plant, substation area, worker camp, construction / laydown area]. At the time of data collection, the proponent had purchased 229 acres of land through willing buyer and willing seller method and the rest of the land is under process to be purchased within September 2023. Land acquisition is not required for the Project access road. The project location is beside the existing LGED Road which is 200m away from the main power plant site. DSEPL constructed a 200m herringbone road from the existing Local Government Engineering Department (LGED) road on their own land for accessing the nearby LGED Road. The electricity transmission line for this power plant has started from the proposed solar power plant (Bhabanipur, Hemayetpur Union) to existing 230/132 KV Grid PGCB Sub-station at Joynagar, Ishwardi, Pabna which is 21.5 km long and contains 79 towers. The width of the RoW has been considered as 10m along the TL and allowable height clearance is 8m from lower conductor. Because land may be accessed through legal means if the land owner refuses access involuntary resettlement requirements are triggered according to ADB SPS 2009, Safeguard Requirement 2. At the time of assessment, footing areas for 76 towers had been purchased with purchase of 3 transmission tower footing areas under process.

Dynamic Sun Energy Private Ltd. (DSEPL) will design, engineer, construct, test, commission, own, operate and maintain the plant for the purpose of generating and supplying electricity to Bangladesh Power Development Board (BPDB) for a period of 20 years on an off-take basis.

Under this project, AECL has been appointed for providing consultancy service for conducting IEE), Environmental and Social Compliance Audit (ESCA) and Resettlement Plan (RP) / Livelihoods

Restoration Plan (LRP) for the solar power plant, transmission line, and its associated facilities. This report only deals with the Environmental & Social Impact Assessment study for the solar power plant, transmission line, and its associated facilities which has been prepared according to the requirement and ToR provided by the ADB to assess the impacts of the power plant and its associated facility in the surrounding area of the plant and suggest the Mitigation measures, Environmental Management plan etc.

1.2 Objective of the Study

This study will identify and evaluate the potential environmental and socio-economic impacts due to construction and operation of the proposed power plant providing detail Environmental Management Plan (EMP) to mitigate the project oriented negative impacts. It is expected that the study will facilitate the planning and design of the proposed power plant in the way of mitigating the potential negative impacts and enhancing the project benefits. The specific objective of this study is to:

- Prepare a project IEE for the solar plant, transmission line, and its associated facilities;

1.3 Scope of Study

Department of Environment, (DoE), has categorized Solar Power plants over 50 MW capacity and Transmission line (gas, electricity) less than 25 km as “**ORANGE category**” as per Environment Conservation Rules 2023. According to ECR, 2023, this project falls under “Orange” category and is required to obtain ‘Site Clearance Certificate’ by undertaking IEE study prior to any kind of construction activities at the project site. DSEPL has submitted an IEE study conducted by DSCL in September-October, 2023 and obtained SCC (Certificate No.: 23-100875, valid from June 19, 2023 to June 18, 2024) in June 2023. The copy of SCC is attached as Annexure 1.

According to the ADB Safeguard Policy Statement 2009, the proposed project is a “**Category B**” project for environment which has few site impacts which can be mitigated and managed via mitigation measures. According to the ADB SPS 2009, “**Category B**” project requires an IEE study has been undertaken as per their requirement of ADB and according to the provided ToR to assess the impacts of the power plant in the surrounding area of the plant and suggest the Mitigation measures, Environmental and Social Management plan etc. The scopes of this study include but not limited to the following:

- Carrying out detail IEE study according to the ToR and provide Report to the client;
- Study of the relevant documents on Policy, Legal and Administrative framework, and their review;
- Carrying out an environmental baseline survey (Meteorology, Climate, Geology, Hydrology, Ambient air, Noise, Ecology, Land use pattern, Natural disasters, Socio-economic condition etc.) covering the project site and components i.e., study areas;
- Identification of environmental impacts due to project activities on the surrounding environment and suggest for mitigation measures in order to eliminate negative impacts and to enhance positive impacts;
- Arrangement of consultation meetings to consult with potentially affected people;

- Development of Environmental and Social Management Plan (ESMP) for both construction as well as operational phases of the project and propose environmental and social monitoring and implementation arrangement for pre-construction, construction, and operation stage of the project;
- Describes institutional or organizational arrangements, technical assistance programs, training programs, procurement of equipment and supplies related to environmental and social management and monitoring, and organizational changes;
- Identification of environmental, health and safety risks and impacts including direct, indirect, cumulative, and induced impacts and propose mitigation and management measures to minimize the identified impacts;
- Present the justification for the project, and to investigate alternatives explored for the project to reduce potential environmental impacts and increase potential benefits;
- Documentation of how stakeholders have been engaged during the IEE Process and feedback incorporation in the IEE.

1.4 IEE Approach & Methodology

The IEE will collect baseline data and to identify anticipated environmental and social effects, both positive and negative that may result from the project. Predictions will consider all aspects and phases of the project. The methodology followed to undertake the IEE study is divided into several tasks elaborated below:

- **Project Data Compilation:** A generic description of the proposed activities relevant to environmental assessment has been compiled with the help of the proponent.
- **Legislative Review:** Information on relevant & prevailing national legislation, regulations, guidelines, and standards was reviewed and compiled.
- **Baseline Data Collection:** Extensive field visits have been conducted to collect primary and secondary data to ensure establishment of proper baseline information. Secondary data on weather, soil, water resources, wildlife and vegetation were reviewed and compiled. Terrestrial ecological and fisheries baseline has also been prepared. This section covers the following aspects comprehensively in addition:
 - Relevant physical, biological, and socioeconomic conditions within the study area;
 - Detail description of local geology, topography, Local climatic condition, hydrological (Surface and ground) condition, geography, extreme environment, wind pattern and soil condition;
 - Description of land use/ land cover has been provided including ecologically critical area, national parks, forest, orchard, cultural heritage site etc. (if any), in the selected project site. Landsat 8 image (Spatial Resolution: 30m*30m and color composite band: 1-7) has been used for Land use and land cover analysis.
 - While describing the meteorological condition, mean, minimum & maximum temperature, monthly & yearly total rainfall, humidity, wind speed & wind direction of last 5 years including several relevant distribution maps of Bangladesh have been collected from Bangladesh Meteorological department (BMD) and provided in the relevant section;

- Cyclones and alignment of cyclones has been provided with maps, figures, data, and information;
 - Similarly, seismicity risk and flood risk have been described with relevant maps, figures, data, and information;
 - Latest Primary and Secondary Socio-economic information have been collected from latest Bangladesh Bureau of Statistics (BBS);
 - In describing ecology, aquatic flora, aquatic fauna, terrestrial flora, terrestrial fauna, and forest as are available in the site and site area have been described with photographs;
 - Description of map unique sites or special features such as parks and protected areas, Heritage Rivers, historic sites, environmentally and culturally significant sites;
 - Physical or cultural heritage (if any);
 - Baseline representative data has been collected (air, noise, surface & ground water, and soil) and their test results have been presented.
- **Identification of potential impacts:** The information collected in the previous steps were reviewed and potential environmental issues were identified.
- **Impact Assessment:** The environmental, socioeconomic, and project information was collected to assess the potential impacts of the proposed activities. The impact assessment was considered for the project during pre-construction, Construction and Operation stage of the project.
- **Suggestion of Mitigation Measures for Adverse Impacts:** After identifying all negative impacts at all stages i. e. pre-construction, Construction and Operation stage of the project, suggestions for mitigation measures have been outlined as per the prevailing national guideline and ADB SPS.
- **Analysis of Alternatives:** Analysis of alternative options was considered to minimize impacts of the Project while undertaking this IEE study. Analysis of Alternatives chapter includes Site and Technology alternative. The “No Build” scenario is also discussed in this chapter.
- **Stakeholder Consultation:** Extensive consultation has been conducted with key stakeholders’ including the local population, vulnerable groups including women, government departments/agencies, and NGOs. A formal public consultation has also been undertaken prior notifying through The Daily Asia Bani and The Muslim Times newspaper.
- **Grievance Redress Mechanisms:** Brief Description has been given of the grievance redress framework/mechanisms (both informal and formal channels), setting out the time frame and mechanisms for i) resolving complaints about environmental and social performance; and ii) worker / contractor related grievances.
- **Suggestion of Construction and Operational Environmental and Social Management and Plan (ESMP):** A structured environment and social management, institutional or organizational arrangements and monitoring plan has been suggested to mitigate all adverse impacts with appropriate monitoring suggestions to ensure the compliance of the local and international lender legislations. Detailed plans required under this framework to ensure implementation of the ESMP will be developed by the Company or its contractors for both remaining construction management and operations following commissioning.
- **Conclusion and Recommendations:** Presented the conclusions drawn from the assessment and provide recommendations.

1.5 Scientific Approach for Baseline Study

1.5.1 Particulate/Air Quality Monitoring

Particulate monitoring is accomplished with Respirable Dust sampler, which is a vacuum type device that draws air with particulate matter through a filter paper. Particles within the range of 100 to 0.1 microns' diameter are ordinarily collected on glass fiber filter. The instrument sucks the ambient air with a blower at a flow rate that allows suspended particles to pass to the filter surface. This sampling filter paper is dried up in the laboratory and the weight difference is the amount of PM_{2.5} and PM₁₀, content measured in micro grams per cubic meter of air collected over a period of 24 hours.

CO Meter (KXL-801 Portable Carbon Monoxide (CO) Detector) is used to measure carbon monoxide. CO meter gives the data of carbon monoxide directly. The CO meter is shown in **Figure 1.1** below:

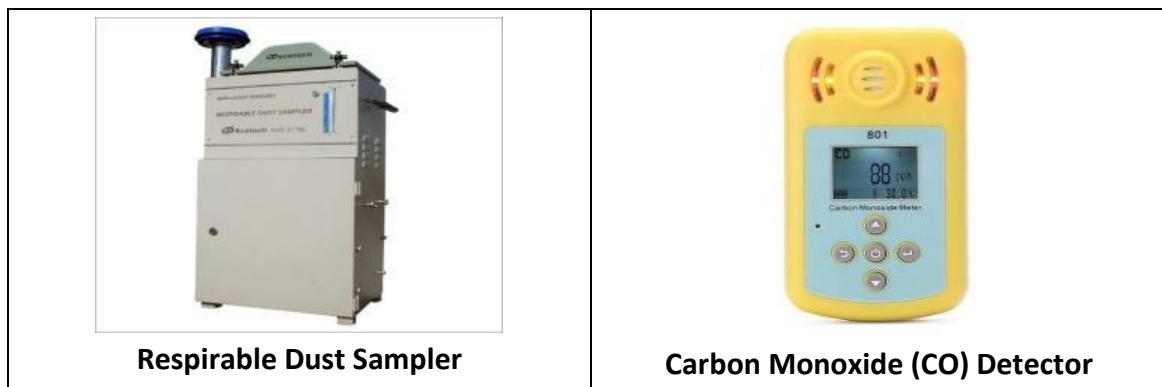


Figure 1.1: Air Quality Monitoring Instrument

1.5.2 Monitoring of Noise Level

Noise level monitoring was performed for 24 hours (day and night) using Noise Meter (CEM Sound Level Meter). At the time of measurement, whenever there was an interfering effect like mike noise, human voice from house and bazaar, vehicular sound, sound of machine and tool from workshop etc., was also recorded. The level of sound is usually expressed in terms of the Sound Pressure Level (SPL) in decibels.



Figure 1.2: Noise Meter (CEM Sound Level Meter)

1.5.3 Water Sampling Method

The procedures described are to be used by field personnel when collecting and handling water samples in the field. On the occasion that field personnel determine that any of the procedures described in this section are either inappropriate, inadequate, or impractical and that another procedure must be used to obtain a water sample, the variant procedure will be documented in the field logbook, along with a description of the circumstances requiring its use. Prepare a Sampling and Analysis Plan (SAP) which describes the sampling locations, numbers, and types of samples to be collected, and the quality control requirements of the assigned project.

Equipment

1) Plastic Bottle 2) Gloves 3) Niskin sampler 4) Icebox

➤ Surface Water sampling procedure

1. Surface water samples shall be collected either by directly filling the container from the surface water body being sampled or by decanting the water from Niskin sampler;
2. Use a funnel to fill up the bottle. The collecting device i.e., Niskin sampler shall not touch the container;
3. Cap the bottle well and label the container prior to storing inside the icebox.

➤ Ground / Drinking Water sampling procedure

1. Select a cold-water faucet for sampling which is free of contaminating devices such as screens, aeration devices, hoses, purification devices or swiveled faucets. Check the faucet to be sure it is clean. If the faucet is in a state of disrepair, select another sampling location;
2. Open the faucet and thoroughly flush. Generally, 2 to 3 minutes will suffice;
3. Do not rinse or overfill container. Close the plastic bottle cap and store in the icebox.

1.5.4 Soil Sampling Method

Collection of large number of samples is recommended so that sample of desired size can be obtained by sub-sampling. For soil quality analysis work, samples are collected from a soil profile representative to the soil of the marked/affected area. Consultant will decide & monitor the sampling location, number of samples to be taken & the frequency of sampling.

- Material/Equipment
- Auger (post hole type)
- Hand spade
- Core sampler
- Sampling bags
- Plastic bucket

➤ Soil sampling procedure

1. Divide the field into different homogenous units based on the visual observation.
2. Remove the surface litter at the sampling spot.

3. Drive the auger to a plough depth of 15 cm and draw the soil sample.
4. Collect at least 5 samples from each sampling locations and place in the plastic bucket.
5. If auger is not effectively applicable, make a 'V' shaped cut to a depth of 15 cm in the sampling spot using spade.
6. Remove thick slices of soil from top to bottom of exposed face of the 'V' shaped cut and place in a clean container.

1.6 The IEE Team

Adroit Environment Consultants Ltd. (AECL) has prepared this report under the guidance and supervision of Dr. Nasir Uddin Khan. The total team composition and their expertise have been given in the table below:

Table 1.1: IEE Team

Professional	Name	Expected Expertise
Team Leader/Project Manager	Dr. Nasir Uddin Khan B.Sc. Engg. (Civil), M.Sc. Engg. (Environment), PhD (USA)	Environmental & Social Impact Assessment (IEE, EMP/ESIA), Industrial Wastewater Treatment, Environment monitoring, Solid waste management, Climate Change, Environmental Management System, Occupational Health & safety, Cleaner Production and Energy efficiency, Air & Noise modeling, environmental education & awareness.
Environmental Expert	Shanjana Haider B.Sc. Engg. (Civil, BUET), M.Sc. Engg. (Civil & Environment)	Analyze the impact of a project on the environment, identifying environmental issues, and recommending solutions. Engineering survey, site plan, Preparation of IEE, EMP & ESIA. Environmental Monitoring and Report preparation.
Environmental Expert	Md. Saiful Islam B.Sc. Engg. (Civil, RUET), M.Sc. Engg. (Civil & Environment)	Engineering survey, site plan, Preparation of IEE, EMP & ESIA. Environmental Monitoring
Ecologist	Dr. Abdul Jabber Howlader M. Sc. (Zoology) Entomology, Ph.D. (Zoology), Commonwealth Post-Doctoral Fellow	Ecological survey on the fauna (macro and micro invertebrates, fishes, birds) of the project area, Primary Aquatic and Ecological survey details analysis, Establishing baseline condition fisheries and aquatic resources.
Fisheries Expert	Dr. Baki Billah B.Sc. (Hons.) in Fisheries, MSc, Ph.D. in Biology.	Taxonomy, Fish culture, Fish population dynamics, Fish pathology and Fisheries Management
Social & Resettlement Expert	Mamun Ar Rashid	Resettlement Action Plan (RAP), Project Complaint Mechanism (PCM), Management of Resettled

Professional	Name	Expected Expertise
	MSS (Political Science, National University), Post Graduate Diploma in Disaster Management from Dhaka University.	Inhabitants, Implementation of Resettlement Action Plan (RAP).
Power Plant and Transmission Line Engineer	Md. Shamsul Alam B.Sc. Engg. (Mechanical, BUET)	Evaluation of interconnection standards and transmission feasibility, system impact and facility studies or testing new electrical components of solar panel designs.
GIS Analyst	Md. Golam Rasul (BURP, RUET)	Analyzing spatial data through mapping software and preparing digital maps with geographic data and various other data sets.
Chemist/Baseline Survey Co-ordinator	Md. Faisal Bin Mahmud	Environmental Monitoring, Laboratory analysis for different environmental parameters.
Field Investigator/Social	Raktim Banik	Base line data collection, secondary data collection, monitor, record, and assess individuals, places, and events.
Field Investigator/Social	Md. Kamal Uddin	Base line data collection, secondary data collection, monitor, record, and assess individuals, places, and events.
Field Investigator/Environment	Md. Rubel Miah	Base line data collection, sample collection from site, sample preservation and laboratory analysis.

1.7 Limitations of the Study

Services performed by the consultant are conducted in a manner consistent with level of care and skill generally exercised by members of the engineering and consulting profession. The report may not exhaustively cover an investigation of all possible aspects and circumstances that may exist. However, an effort is made to discover all meaningful areas under the stipulated time available.

In evaluating subject site, consultant relies in good faith on information provided by client's management or Employees. The Consultant assume that the information provided is factual, accurate and accepts no responsibility for any deficiency, misstatement or inaccuracies contained in this report as a result of omission or misrepresentation of any person interviewed or contacted. However, the consultant notifies the contradictions and errors in the data, where it seems appropriate.

According to standard practice, all the seasonal viewpoints including a complete hydrological cycle ought to be considered amid the conduction of IEE study. However, due to time constraints, a complete hydrological cycle covering all the seasonal aspects could not be covered in this study. Secondary data was used in this study to overcome this issue. It should be recognized that the information given in the report is time specific and with the passage of time the relevancy of data and analysis may suffer. Specific circumstances and condition of site can change due to which conclusion and opinions may also change.

1.8 Acknowledgement

The IEE Report has been prepared basically with the support from Dynamic Sun Energy Private Ltd. and from various government agencies and NGOs including Department of Environment (DOE), Bangladesh Meteorological Department (BMD), Bangladesh Bureau of Statistics (BBS), Bangladesh Water Development Board (BWDB), Department of Fisheries, Department of Agricultural Extension, UNO Office and Upazila Parishad of Pabna Sadar Upazila, Hemayetpur Union Parishad, Local Representatives etc. We would like to express our gratitude to each organization and its employees for their contribution and kind co-operation in conducting the study.

2 LAW AND LEGISLATION

2.1 Introduction

The emerging environmental scenario calls for attention on conservation and judicious use of natural resources. As an institutional arrangement, Government of Bangladesh has designated the "Department of Environment" (DOE) with the responsibility for the regulatory functions to enforce of the provisions of environmental laws, rules, and regulations to prevent environmental degradation in the country. Under these legal provisions, the industrial entrepreneurs/ project owner must take mitigation measures to protect the environment from pollution and adverse impacts and must get "Environmental Clearance" from DOE before setting up and running their industries/project.

Solar Power Plant over 50 MW capacity and Transmission line (gas, electricity) less than 25 km are listed under the "**Orange Category**" in ECR 2023 (i.e., serial no. 8 in the ECR 2023 Orange list in Schedule-1.). The environmental classifications for industrial projects in Bangladesh are based on "inclusion lists" given in the ECR 2023 with "**ORANGE**" being the second highest. According to ECR, 2023, this project falls under "Orange" category and is required to obtain 'Site Clearance Certificate' prior to any kind of construction activities at the project site. A nationally-required IEE study is required to obtain SCC from DoE. DSEPL has submitted an IEE study conducted by DSCL in September-October, 2023. The report was submitted to DoE in March 2023 (Submission copy is attached as Annexure 24). After few revisions the report was approved and SCC was provided (Certificate No.: 23-100875, valid from June 19, 2023 to June 18, 2024) in June 2023 against the final version of the IEE. The copy of SCC is attached as Annexure 1 . This clearance is subject to renewal every year.

According to the Environmental categorization of ADB Safeguard Policy Statement (SPS) 2009, the proposed project is a "**Category B**" project which has environmental impacts which can be mitigated and managed via mitigation measures. According to the ADB SPS 2009, "**Category B**" project requires an IEE study to assess the impacts of the power plant along with the transmission line and suggest the mitigation measures, environmental management plan etc. According to the Involuntary Resettlement categorization of ADB Safeguard Policy Statement (SPS) 2009, the project falls under "**Category B**", as land acquisition for TL will be done based on negotiation and land may be accessed through legal means if the land owner refuses access so, involuntary resettlement requirements are triggered according to ADB SPS 2009, Safeguard Requirement 2. For this a Resettlement Plan should be undertaken and followed by the Project Proponent. According to the indigenous people categorization of ADB Safeguard Policy Statement (SPS) 2009, this project falls under "**Category C**", as there is no sign of indigenous people in or around the project site

The prevailing national policies, strategies, laws, rules, action plans along with international guidelines i.e., ADB SPS 2009, World Bank EHS, IFC guidelines, JICA guidelines etc. on environment are discussed briefly in the following sections.

2.2 Implications of Policies and Regulations on the Proposed Project

Table 2.1 below presents an outline of other National legal instruments that will have relevance to the proposed Project with respect to the social and environmental considerations.

Table 2.1: National Legal Instruments relevant to the Project

Act/ Rule/ Law/ Ordinance/Policy/ Guidelines	Enforcement Agency - Ministry/ Authority	Key Features	Applicability to the Project
<p>National Environmental Policy, 2018</p>	<p>Department of Environment Ministry of Environment, Forest, and Climate Change (MOEFCC)</p>	<ul style="list-style-type: none"> • Natural equilibrium provision and overall development of the country through environmental protection and sustainable management; • The spread of adaptation programs to reduce the adverse effects of climate change in the country; • Encourage collection and promotion of low carbon emission technology in the country; • Identifying and controlling all types of environmental pollution and degradation activities; • Ensure sustainable, long-term and environment friendly use of all natural resources; • Ensure the Environmental Impact Assessment and Strategic Environmental Assessment in all necessary sectors; • Strengthen observations on proper compliance with environmental laws and regulations. • To maintain the ecological balance and overall progress and development of the country through protection and improvement of the environment. 	<p>According to the latest ECR 2023 the proposed project and its associated facilities falls under “ORANGE Category” and requires Site Clearance Certificate (SCC) from Department of Environment (DoE) to initiate construction work which the project authority has already received from DoE (Certificate No.: 23-100875, valid from June 19, 2023 to June 18, 2024) upon submission of IEE report on October 2022. The study was undertaken in September – October 2022. This SCC is subject to renewal every year prior to the operation of the project.</p> <p>According to the ECR 2023, DSEPL needs to apply for Environmental Clearance Certificate (ECC) from DoE prior to start operation of the project. Pre-condition to apply for an ECC is to submit the monitoring reports according to the approved IEE report from DoE and follow all the conditions mentioned in the SCC and EMP of the approved IEE.</p>

Act/ Rule/ Law/ Ordinance/Policy/ Guidelines	Enforcement Agency - Ministry/ Authority	Key Features	Applicability to the Project
Industrial Policy, 1991	Ministry of Industry (Moi)	<ul style="list-style-type: none"> To conserve ecological balance and prevent pollution during industrialization; To take effective steps for pollution control and conservation of environment during industrialization; To ensure embodying of necessary pollution control and preventive measures by industrial investment project endangering environment. 	Applicable as the project type is an industrial development which may have impacts on ecology and may pollute the environment.
National Conservation Strategy, 1992	Ministry of Environment, Forest and Climate Change (MOEFCC)	<ul style="list-style-type: none"> To use minimum possible area of land in exploration sites; Rehabilitate site when abandoned; To take precautionary measures against Environmental Pollution from liquid effluents, condensate recovery and dehydration Plants; and Technology assessment for selection of appropriate technologies. 	Applicable as the project is associated with land use and environmental pollution and appropriate technology should be implemented
National Environmental Management Action Plan (NEMAP), 1995	Department of Environment Ministry of Environment, Forest and Climate Change (MOEFCC)	<ul style="list-style-type: none"> To identify the key environmental issues affecting Bangladesh; To identify the actions necessary to halt or reduce the rate of environmental degradation; To improve the natural and built environment; To conserve the habitats and biodiversity; To promote the sustainable development; To improve the quality of life of the people. 	Applicable as the project is related with environmental issues, may affect biodiversity and will promote sustainable development
The Environment Conservation Act, 1995	Department of Environment	<ul style="list-style-type: none"> Define Applicability of environmental clearance; 	Applicable as the proposed project is eligible to take environmental clearance and it's

Act/ Rule/ Law/ Ordinance/Policy/ Guidelines	Enforcement Agency - Ministry/ Authority	Key Features	Applicability to the Project
and subsequent amendments in 2000 2002 and 2010	Ministry of Environment, Forest and Climate Change (MOEFCC)	<ul style="list-style-type: none"> • Regulation on development activities from environmental perspective; • Framing applicable limits for emissions and effluents; • Framing of standards for air, water, and noise quality; • Formulation of guidelines relating to control and mitigation of environmental pollution, conservation, and improvement of environment; • Declaration of Ecologically critical areas. 	activity associated with environmental issues and air, noise, soil and water quality of the project area should meet standard value
Environmental conservation Rules, 2023	Department of Environment Ministry of Environment, Forest and Climate Change (MOEFCC)	<ul style="list-style-type: none"> • Requirement of environmental clearance certificate for various categories of projects; • Requirement of IEE/ESIA as per category; • New Categorization of different Industries, Power Plants and Projects according to their impacts on environment; • Provides new standards for quality of surface water, coastal water, drinking water, sewage discharge and liquid waste discharge from factories; • Revised fee list has been provided for clearance certification, renewal, testing and others; • Procedures of Public Consultation; • Enlistment procedures of Environmental Consultants or Specialists. 	Applicable as the Project falls under Orange Category and require site clearance certificate prior to start the construction work and environmental Clearance Certificate prior to start the operation of the plant
Air Pollution (Control) Rules, 2022	Department of Environment	<ul style="list-style-type: none"> • Provides the new standards of Ambient Air Quality and Smell; 	Applicable for maintaining the standards of air quality and emissions from vehicles or any other sources.

Act/ Rule/ Law/ Ordinance/Policy/ Guidelines	Enforcement Agency - Ministry/ Authority	Key Features	Applicability to the Project
	Environment Pollution Control Section-1 Ministry of Environment, Forest and Climate Change (MOEFCC)	<ul style="list-style-type: none"> National Air Standard Management Plan has been provided; Air Pollution Resistance Plan has been initiated; An Air Pollution Control related National Committee has been formed headed by Cabinet Secretary; Provides new standards and acceptable limits for emissions/discharges from vehicles and other sources. 	
Noise Pollution (Control) Rules 2006	Ministry of Environment, Forest and Climate Change (MOEFCC)	<ul style="list-style-type: none"> Prevention of Noise pollution; Standards for noise level. 	Applicable as noise will be generated due to the construction and operation activity
Environmental Court Act, 2010	Ministry of Environment, Forest and Climate Change (MOEFCC) Ministry of Law, Justice and Parliamentary Affairs	<ul style="list-style-type: none"> GoB has given highest priority to environment pollution; Passed 'Environment Court Act, 2000 for completing environment-related legal proceedings effectively; Provides the Jurisdictions of environment court, the penalty for violating court's order, trial procedure in special magistrate's court, the power of entry and search, the procedure for investigation, procedure and power of environment court, the authority of environment court to inspect, appeal procedure and formation of environment appeal court. 	Applicable for following and completing environmental legal requirements effectively (if required)
National Land-use Policy, 2001	Ministry of Land	<ul style="list-style-type: none"> To deal with several lands uses including agriculture (crop production, fishery, and livestock), housing, 	Applicable as project activity involves land use alteration.

Act/ Rule/ Law/ Ordinance/Policy/ Guidelines	Enforcement Agency - Ministry/ Authority	Key Features	Applicability to the Project
		forestry, industrialization, railways and roads, tea and rubber; • To identify land use constraints in all these sectors.	
Acquisition and Requisition of Immovable Properties Act 2017	Ministry of Land	• Current GOB Act and Guidelines, relating to acquisition and requisition of land.	Applicable as the project needs to acquire land
Bangladesh Labor Act, 2006 (amended in 2018)	Ministry of Labour and Employment	• Provides labour recruitment process, labour-employer relationships, minimum wages, wage payment, incidental costs, occupational hazards, collective bargaining, dispute resolution and workplace environment; • Standard facilities, size and environment of the labour camp has been mentioned; • Each employee can work for 8-hours per day. Any shift exceeding 6-hours should be coupled with a 1-hour lunch break, and a 5-hour shift should have a 30-minutes lunch break. • The minimum age to work is 14 (although a special clause states that children between the ages of 12 and 14 may be Employed to do “light work” that does not endanger their health, development, and education	Applicable as skilled, semi- skilled and day labors will work in the project in different phase
Bangladesh National Building Code (BNBC) 2020	Ministry of Housing and Public Works	• This code is followed in Bangladesh to build safe houses and buildings;	Applicable as the structures will be built in the project area

Act/ Rule/ Law/ Ordinance/Policy/ Guidelines	Enforcement Agency - Ministry/ Authority	Key Features	Applicability to the Project
		<ul style="list-style-type: none"> Earthquakes and wind effect of different building systems are incorporated in this code. 	
Bangladesh Water Act, 2013	Ministry of Water Resources (MoWR)	<ul style="list-style-type: none"> All forms of water (e.g., surface water, ground water, sea water, rain water and atmospheric water) within the territory of Bangladesh belong to the government on behalf of the people; The private landowners will be able to use the surface water inside their property; Requirement for permits/licenses for large scale water withdrawal by individuals and organizations beyond domestic use. 	Applicable as the proposed project will involve groundwater use.
The Protection and Conservation of Fish Act 1950 (amended in 1973, 1982, 1995 and 2002)	Ministry of Fisheries and Livestock	<ul style="list-style-type: none"> Protection and conservation of fish in Government-owned water bodies; prohibit the destruction of, or any attempt to destroy, fishes by the poisoning of waters or the depletion of fisheries by pollution by trade effluents or otherwise; prohibit the destruction of, or any attempt to destroy, fishes by explosives, gun, bow and arrow in inland water or within coastal territorial waters; prohibit the destruction of or any attempt to destroy fishes by drying or dewatering of any fishery. 	As the Padma River is 1.5 km away and a branch of Padma river passes by the project area so the conservation of fishes in the water bodies should be maintained.
National Water Policy, 2000	Ministry of Water Resources (MOWR)	<ul style="list-style-type: none"> Protection, restoration, and enhancement of water resources; 	Applicable for the protection of water resources and water quality of the water sources around the project area.

Act/ Rule/ Law/ Ordinance/Policy/ Guidelines	Enforcement Agency - Ministry/ Authority	Key Features	Applicability to the Project
		<ul style="list-style-type: none"> • Protection of water quality, including strengthening regulations concerning agrochemicals and industrial effluent; • Participation of local communities in all water sector development. 	
National River Protection Commission Act 2013	Ministry of Land	<ul style="list-style-type: none"> • Manage and control water and environmental pollution, etc.; • Ensure socio-economic development of a multi-use and rational use of natural resources. 	Project activity may involve water and environmental pollution
The Electricity Act, 1910 amended in 2006 and 2018	Ministry of Power, energy and Mineral Resources	<ul style="list-style-type: none"> • The Electricity Act 2018, repeals the provisions of Electricity Act 1910; • Ensure the supply and optimal use of electrical energy which is attainable through compensatory punishment. 	Applicable as the project involves electricity use and generation
Electricity Rules, 2020	Ministry of Power, Energy and Mineral Resources	<ul style="list-style-type: none"> • Electricity Rules has been published by ministry on November 2020 based on Clause 59 of Electricity Act 2018 (SRO 297 of Act/2020). • The main observation is to provide compensation for the installation of transmission line towers to the land owners as per the applicable laws and policy. 	Applicable as some household and agricultural land will be affected by this project.
The National Energy Policy, 1996 updated in 2004	Ministry of Power, Energy and Mineral Resources	<ul style="list-style-type: none"> • To provide energy for sustainable economic growth so that the economic development activities of different sectors are not constrained due to shortage of energy; 	Applicable as the proposed project is using indigenous and sustainable energy source

Act/ Rule/ Law/ Ordinance/Policy/ Guidelines	Enforcement Agency - Ministry/ Authority	Key Features	Applicability to the Project
		<ul style="list-style-type: none"> • To meet the energy needs of different zones of the country and socio-economic groups; • To ensure optimum development of all the indigenous energy sources; • To ensure sustainable operation of the energy utilities; • To ensure rational use of total energy sources. 	
Energy Regulatory Commission Act (2003)	Ministry of Power, Energy and Mineral Resources	<ul style="list-style-type: none"> • Enhancing the efficient use of energy; • Resolve disputes relating to energy matters; • Ensuring efficient use, quality services determine traffic and safety enhancement; • Ensuring appropriate remedy for consumer disputes and; • Ensuring control of the environmental standards associated with the production of energy under existing laws. 	Applicable as the project involves energy usage, traffic, and safety issues, environmental pollution
Solid Waste Management Rules 2021	Ministry of Environment, Forest, and Climate Change (MOEFCC)	<ul style="list-style-type: none"> • In the case of resource recovery from waste, considering the waste hierarchy, all steps of waste generation, rejection, waste reduction, reuse, recycling, recovery, purification, and residue management must be followed in sequence before final disposal. • The waste generated from the construction should be kept separately until it is handed over to the local government authorities so that the dust does not 	Applicable as different kinds of solid waste will be generated due to project activities.

Act/ Rule/ Law/ Ordinance/Policy/ Guidelines	Enforcement Agency - Ministry/ Authority	Key Features	Applicability to the Project
		spread into the air or fall into the drains through rainwater.	
Hazardous Waste (E-waste) Management Rules, 2021	Ministry of Environment, Forest, and Climate Change (MOEFCC)	<ul style="list-style-type: none"> • Applicable to persons/organization engaged in manufacture, marketing, purchase, sale, import, export, storage, stocking for research in laboratories, disposal, repair, processing and transportation or all related activities of electrical and electronic products. 	Applicable as different kinds of electrical and chemical wastes will be used during the project.
Fatal Accidents Act, 1855	Ministry of Labor and Employment	<ul style="list-style-type: none"> • This Act was promulgated to provide compensation to families for loss occasioned by the death of a person caused by actionable wrong. • The company will be liable to pay compensation in case of death of any worker/employee or damages in case death has not ensued but such circumstances could have resulted in death. 	Applicable as during construction and operation phases accident/incidents can be occurred and compensation should be provided according to the act.
Guidelines for the Implementation of Solar Power Development Program, 2013	Power Division Ministry of Power, Energy and Mineral Resources	<ul style="list-style-type: none"> • Provisions for setting up a solar park; • Project site selection criteria; • Implementation of Solar Mini Grid Projects; • Financial benefits of the Proponent and Foreign Investors. 	Applicable as the proposed project is a solar power plant project
National Solar Energy Roadmap (2021-2041)	Power Division Ministry of Power, Energy and Mineral Resources	<ul style="list-style-type: none"> • Described the most recent component-wise status of solar PV energy implementation in Bangladesh. • Proposed the component- and decade-wise solar PV capacity targets to be achieved in Bangladesh by the year 2041. 	Applicable as the proposed project is a solar power plant project

Act/ Rule/ Law/ Ordinance/Policy/ Guidelines	Enforcement Agency - Ministry/ Authority	Key Features	Applicability to the Project
		<ul style="list-style-type: none"> • Suggested the general actions that can be undertaken to meet the targets as proposed • Elaborated the specific actions for each component of the solar PV sector. • Discussed the implementation challenges and the possible way outs. 	
<p>Renewable Energy Policy, 2008</p>	<p>Power Cell, Power Division, Ministry of Power, Energy & Mineral Resources</p>	<ul style="list-style-type: none"> • Defined the necessity for the country to develop renewable energy technology; • Described the essentiality of commercial dimensions and rational policy dissemination on renewable energy usage; • Mentioned about the establishment of “Sustainable Energy Development Agency (SEDA)”; • The renewable energy includes solar, wind, biomass, hydro, geo-thermal, tidal wave. 	<p>Applicable as the proposed project is associated with renewable energy</p>

2.3 Applicable Lenders' Requirements

2.3.1 ADB's SAFEGUARD POLICY STATEMENT, 2009

The SPS applies to all ADB-financed and/or ADB-administered projects and their components, regardless of the source of financing, including investment projects funded by a loan; and/or a grant; and/or other means, such as equity and/or guarantees. ADB works with borrowers and clients to put into practice the requirements of SPS. The objectives of ADB's safeguards are to:

- ✓ avoid adverse impacts of projects on the environment and affected people, where possible;
- ✓ minimize, mitigate, and/or compensate for adverse project impacts on the environment and affected people when avoidance is not possible; and
- ✓ Assist borrowers and clients to strengthen their safeguard systems and develop the capacity to manage environmental and social risks.

ADB's SPS sets out the policy objectives, scope and triggers, and principles for three key safeguard areas:

- ✓ Environmental safeguards;
- ✓ Involuntary Resettlement safeguards; and
- ✓ Indigenous Peoples safeguards.

To help borrowers and clients and their projects achieve the desired outcomes, ADB adopts a set of specific safeguard requirements that borrowers and clients are required to meet in addressing environmental and social impacts and risks. These safeguard requirements are as follows:

- ✓ Safeguard Requirements 1: Environment (Appendix 1 of SPS);
- ✓ Safeguard Requirements 2: Involuntary Resettlement (Appendix 2 of SPS);
- ✓ Safeguard Requirements 3: Indigenous Peoples (Appendix 3 of SPS); and
- ✓ Safeguard Requirements 4: Special Requirements for Different Finance Modalities (Appendix 4 of SPS).

In addition, ADB does not finance activities on the prohibited investment activities list (Appendix 5 of SPS). Furthermore, ADB does not finance projects that do not comply with its safeguard policy statement, nor does it finance projects that do not comply with the host country's social and environmental laws and regulations, including those laws implementing host country obligations under international law.

2.3.1.1 ADB Project Categorization

The ADB Safeguard Policy Statement 2009 sets out the requirements for ADB's operations to undertake an environmental assessment for projects funded by the bank. The environmental assessment requirements for projects depend on the significance of impacts on the environment by the project. Each proposed project is scrutinized as to its type; location; the sensitivity, scale, nature,

and magnitude of its potential environmental impacts; and availability of cost-effective mitigation measures. A project is classified as one of the environmental categories (A, B, C, or FI).

- **Category A:** A proposed project is classified as category A if it is likely to have significant adverse environmental impacts that are irreversible, diverse, or unprecedented. These impacts may affect an area larger than the sites or facilities subject to physical works. An ESIA is required.
- **Category B:** A proposed project is classified as category B if its potential adverse environmental impacts are less adverse than those of category A projects. These impacts are site-specific, few if any of them are irreversible, and in most cases mitigation measures can be designed more readily than for category A projects. An IEE is required.
- **Category C:** A proposed project is classified as category C if it is likely to have minimal or no adverse environmental impacts. No environmental assessment is required although environmental implications need to be reviewed.
- **Category FI:** A proposed project is classified as category FI if it involves investment of ADB funds to or through a FI.

According to this categorization, the proposed project falls under **Category B**.

❖ **Basic Environmental Assessment Requirements**

Category B: An IEE is required for Category B projects to determine whether or not significant environmental impacts warranting an ESIA are likely. If an ESIA is not needed, the IEE is regarded as the final environmental assessment report. Public consultation must be undertaken during the IEE process. An IEE report is required to follow the recommended format. For Category B projects deemed environmentally sensitive, the SIEE should be submitted to the Board at least 120 days prior to the Board consideration. In addition to the SIEE, IEE will be made available to Board members upon request. The Bank may make the SIEE available to locally affected groups and NGOs, upon request, through the Board Member of the DMC concerned, or through the Bank's Depository Library program, except where confidentiality rules would be violated.

❖ **Involuntary Resettlement**

A project's involuntary resettlement category is determined by the category of its most sensitive component in terms of involuntary resettlement impacts. The involuntary resettlement impacts of an ADB-supported project are considered significant if 200 or more persons will experience major impacts, which are defined as (i) being physically displaced from housing, or (ii) losing 10% or more of their productive assets (income generating). The involuntary resettlement safeguards cover both physical and economic displacement as a result of (i) involuntary acquisition of land, or (ii) involuntary restrictions on land use or on access to legally designated parks and protected areas. Such displacement can be full or partial, permanent, or temporary. The level of detail and comprehensiveness of the resettlement plan are commensurate with the significance of the potential impacts and risks. A project is assigned to one of the following categories depending on the significance of the probable involuntary resettlement impacts:

- **Category A:** A proposed project is classified as category A if it is likely to have significant involuntary resettlement impacts. A resettlement plan, including assessment of social impacts, is required;
- **Category B:** A proposed project is classified as category B if it includes involuntary resettlement impacts that are not deemed significant. A resettlement plan, including assessment of social impacts, is required;
- **Category C:** A proposed project is classified as category C if it has no involuntary resettlement impacts. No further action is required; and
- **Category FI:** A proposed project is classified as category FI if it involves the investment of ADB funds to, or through, a financial intermediary (paragraphs 53–58).

This proposed project falls under **Category B** according to this categorization.

❖ **Indigenous Peoples**

ADB also screen all projects to determine whether they have potential impacts on Indigenous Peoples. For projects with impacts on Indigenous Peoples, an Indigenous Peoples Plan needs to be prepared. The degree of impacts is determined by evaluating (i) the magnitude of the impact on Indigenous Peoples' customary rights of use and access to land and natural resources; socio-economic status; cultural and communal integrity; health, education, livelihood systems, and social security status; or indigenous knowledge; and (ii) the vulnerability of the affected Indigenous Peoples.

There are no Indigenous people around the project site and therefore the Project is categorized as C for Indigenous People impacts.

2.3.2 ADB's Social Protection Strategy, 2001

Social protection is a key step in ADB's battle to have Asia and the Pacific region "free of poverty." The relevance and applicability of the social protection strategy is due to the requirement for borrowers to adhere to the ILO Core labour standards. The SPS spells out the scope of social protection and commitment of the ADB to develop priority interventions in five major elements:

- labor market policies and programs designed to generate employment, improve working conditions, and promote the efficient operations;
- social insurance programs to cushion the risks associated with unemployment, ill health, disability, work-related injury, and old age;
- social assistance and welfare service programs for the vulnerable groups with inadequate means of support, including single mothers, the homeless, or physically or mentally challenged people;
- micro and area-based schemes to address vulnerability at the community level, including micro insurance, agricultural insurance, social funds, and programs to manage natural disasters; and child protection to ensure the healthy and productive development of children.

2.3.3 ADB Access to Information Policy, 2019

The objective of the AIP is to promote stakeholder trust in ADB and to increase the development impact of ADB activities. The policy reflects ADB's commitment to transparency, accountability, and participation by stakeholders in ADB-supported development activities in Asia and the Pacific. It also recognizes the right of people to seek, receive, and impart information about ADB's operations. The AIP is based on the following principles:

- i. **Clear, timely, and appropriate disclosure.** ADB discloses information about its operations in a clear, timely, and appropriate manner to enhance stakeholders' ability to meaningfully engage with ADB and to promote good governance.
- ii. **Presumption in favor of disclosure.** ADB discloses information unless that information falls within the exceptions to disclosure specified in the policy.
- iii. **Limited exceptions.** Full disclosure of information is not always possible. For example, ADB needs to explore ideas, share information, hold candid discussions, and freely debate ideas internally and with its members or clients. In other cases, ADB needs to consider the special requirements of its non-sovereign operations and clients, 8 protect personnel's right to privacy, or safeguard its own and its clients' legitimate business interests. The policy provides a limited set of exceptions that balances the rights and interests of various parties. However, ADB reserves the right, under exceptional circumstances, to override the policy exceptions or not to disclose information that it would normally disclose.
- iv. **Proactive disclosure.** ADB proactively shares its knowledge products and information about its operations in a timely manner to facilitate participation in ADB decision-making. While the ADB website remains the primary vehicle for proactive disclosure, ADB also uses other appropriate means to disclose and communicate information.
- v. **Sharing of information and ideas.** The AIP includes processes by which people may equally seek, receive, and convey information and ideas about ADB operations. Effective communications and exchange of information and ideas with stakeholders is a vital component of effective and sustainable development.
- vi. **Providing information to project-affected people and other stakeholders.** ADB works closely with its borrowers and clients to ensure two-way communications about ADB projects with project affected people and other stakeholders. This is done within a time frame, using relevant languages,⁹ and in a way that allows project affected people and other stakeholders to provide meaningful inputs into project design and implementation.
- vii. **Country and client ownership.** ADB borrowers and clients own the projects that ADB supports or in which the bank invests. Thus, in some cases, the views of borrowers and clients regarding the content and timing of disclosure are considered before documents are disclosed.
- viii. **Clear appeals process.** A clear process to appeal an ADB decision not to disclose requested information is an important part of a meaningful disclosure framework.
- ix. **Continuous monitoring.** ADB monitors the effectiveness of the policy, learns lessons from its successes and shortcomings, and stays abreast of new technologies and practices.

2.4 JICA Guidelines for Environmental and Social Considerations, January 2022

JICA clearly states the requirements regarding environmental and social considerations in the JICA Guidelines, which project proponents must meet. JICA provides the project proponents with support for meeting the requirements through cooperation projects. JICA reviews the fulfillment of the

requirements by the project proponents, and makes decisions based on the results of the review. JICA recognizes that the following eight principles are particularly important:

1. A wide range of impacts must be addressed; JICA covers a wide range of environmental and social impacts as items to be considered.
2. Environmental and social considerations must be implemented from an early stage until monitoring stage. JICA applies a Strategic Environmental Assessment (SEA) when conducting Master Plan studies etc. JICA encourages project proponents to ensure environmental and social considerations from an early stage until monitoring stage.
3. JICA reviews the environmental and social considerations in accordance with the mitigation hierarchy. JICA confirms that environmental and social impacts are avoided to the extent possible, and if this is not possible, the impacts are minimized, reduced, then mitigated, and if significant impacts remain, compensations are considered.
4. JICA is responsible for accountability when implementing cooperation projects. JICA ensures accountability and transparency when implementing cooperation projects.
5. JICA requests stakeholders for their participation; JICA ensures meaningful participation of stakeholders and incorporates stakeholder opinions into decision-making processes, in order to implement environmental and social considerations that are appropriate to the local situation and to reach a consensus. JICA responds to suggestions raised by stakeholders. Stakeholders who participate should be responsible for their own statements.
6. JICA discloses information; JICA actively discloses information on environmental and social considerations in collaboration with project proponent, in order to ensure accountability and to promote
7. participation of various stakeholders.
8. JICA enhances its organizational capacity. JICA makes efforts to enhance the capacity of its organizations and operations, in order to sufficiently and effectively implement environmental and social considerations.
9. JICA considers promptness; JICA addresses requests for acceleration of its process towards project implementation, while undertaking environmental and social considerations.

2.5 World Bank EHS Guidelines

2.5.1 General Environment, Health & Safety (EHS) Guidelines, 2007

The Environmental, Health, and Safety (EHS) Guidelines are technical reference documents with general and industry-specific examples of Good International Industry Practice (GIIP). These General EHS Guidelines are designed to be used together with the relevant Industry Sector EHS Guidelines which provide guidance to users on EHS issues in specific industry sectors. Effective management of environmental, health, and safety (EHS) issues entails the inclusion of EHS considerations into corporate and facility-level business processes in an organized, hierarchical approach that includes the following steps:

- Identifying EHS project hazards and associated risks as early as possible in the facility development or project cycle, including the incorporation of EHS considerations into the site selection process, product design process, engineering planning process for capital requests,

engineering work orders, facility modification authorizations, or layout and process change plans.

- Involving EHS professionals, who have the experience, competence, and training necessary to assess and manage EHS impacts and risks, and carry out specialized environmental management functions including the preparation of project or activity-specific plans and procedures that incorporate the technical recommendations presented in this document that are relevant to the project.
- Understanding the likelihood and magnitude of EHS risks, based on:
 - The nature of the project activities, such as whether the project will generate significant quantities of emissions or effluents, or involve hazardous materials or processes;
 - The potential consequences to workers, communities, or the environment if hazards are not adequately managed, which may depend on the proximity of project activities to people or to the environmental resources on which they depend.
- Prioritizing risk management strategies with the objective of achieving an overall reduction of risk to human health and the environment, focusing on the prevention of irreversible and / or significant impacts.
- Favoring strategies that eliminate the cause of the hazard at its source, for example, by selecting less hazardous materials or processes that avoid the need for EHS controls.
- When impact avoidance is not feasible, incorporating engineering and management controls to reduce or minimize the possibility and magnitude of undesired consequences, for example, with the application of pollution controls to reduce the levels of emitted contaminants to workers or environments.
- Preparing workers and nearby communities to respond to accidents, including providing technical and financial resources to effectively and safely control such events, and restoring workplace and community environments to a safe and healthy condition.
- Improving EHS performance through a combination of ongoing monitoring of facility performance and effective accountability.

2.5.2 Guidelines for electric power transmission and distribution, 2007

The EHS Guidelines for Electric Power Transmission and Distribution include information relevant to power transmission between a generation facility and a substation located within an electricity grid, in addition to power distribution from a substation to consumers located in residential, commercial, and industrial areas. Electric power transmission and distribution systems are often located in conjunction with highway, road, and other rights-of-way to minimize both costs and disturbance to ecological, socioeconomic, and cultural resources. Other factors, including land value, view sheds, archaeological resources, geotechnical hazards, accessibility, parks, and other important features also contribute to the locating of transmission and distribution line right-of-way alignments. This document is organized according to the following sections:

- Section 1.0 — Industry-Specific Impacts and Management
- Section 2.0 — Performance Indicators and Monitoring
- Section 3.0 — References and Additional Sources
- Annex A — General Description of Industry Activities

2.6 International Covenant on Economic, Cultural and Social Rights

The International Covenant on Economic, Social and Cultural Rights (ICESCR) commits all State parties (currently 160) to protect the economic, social, and cultural rights of all individuals. It was adopted in 1966 and entered into force in 1976. Bangladesh ratified ICESCR on 1998. ICESCR protects the right to:

- an adequate standard of living;
- highest attainable standard of physical and mental health;
- education;
- social security;
- work and fair treatment at work.

The Convention recognizes the right of all persons to self-determination, including the self-determination of political status; economic, social, and cultural goals; and the management and disposal of their resources. It also sets out the principle of “progressive realization” which underpins the whole Covenant.

ICESCR, when combined with the International Covenant on Civil and Political Rights (ICCPR) and the Universal Declaration of Human Rights (UDHR), makes up what is referred to as the International Bill of Human Rights. There are currently 23 General Comments which clarify the scope and content of ICESCR’s provisions.

2.7 ILO Core Labour Standards Convention

International labour standards are legal instruments drawn up by the ILO's constituents (governments, employers, and workers) and setting out basic principles and rights at work. In many cases, a Convention lays down the basic principles to be implemented by ratifying countries, while a related Recommendation supplements the Convention by providing more detailed guidelines on how it could be applied. Recommendations can also be autonomous, i.e., not linked to a Convention. The eleven fundamental instruments are:

- Freedom of Association and Protection of the Right to Organize Convention, 1948 (No. 87)
- Right to Organize and Collective Bargaining Convention, 1949 (No. 98)
- Forced Labour Convention, 1930 (No. 29) (and its 2014 Protocol)
- Abolition of Forced Labour Convention, 1957 (No. 105)
- Minimum Age Convention, 1973 (No. 138)
- Worst Forms of Child Labour Convention, 1999 (No. 182)
- Equal Remuneration Convention, 1951 (No. 100)
- Discrimination (Employment and Occupation) Convention, 1958 (No. 111)
- Occupational Safety and Health Convention, 1981 (No. 155)
- Promotional Framework for Occupational Safety and Health Convention, 2006 (No. 187)

The four governance Conventions are:

- Labour Inspection Convention, 1947 (No. 81)
- Employment Policy Convention, 1964 (No. 122)
- Labour Inspection (Agriculture) Convention, 1969 (No. 129)
- Tripartite Consultation (International Labour Standards) Convention, 1976 (No. 144)

2.8 IFC and European Bank for Reconstruction and Development (EBRD) Guidance Note on Workers' Accommodation: Processes and Standards (September 2009)

This guidance note, developed jointly by IFC and the EBRD, looks at the provision of housing or accommodation for workers by employers and the issues that arise from the planning, construction, and management of such facilities. This publication aims to provide practical guidance to IFC and EBRD specialists, consultants and clients on appropriate policies and standards relating to workers' accommodation.

At the initial stage of any project, there is a need to assess whether accommodation for workers is required, and if so, whether this can be provided within existing local communities or whether new facilities should be constructed. The likely impact on local communities and the housing market of either option should be assessed.

Before constructing any facilities, other potential impacts should be evaluated. These may include the impact of construction, and the effect of a new housed labour force on community services, such as health, and on community cohesion and safety. These assessments should form part of a project's Environmental and Social Impact Assessment.

The next step is to consider the standards to be applied for the location, arrangement, and construction of any facilities. Issues here include consideration of a safe and healthy location, application of appropriate construction standards, provision of adequate and sanitary living conditions and provision of appropriate leisure and health facilities.

Lastly, when the accommodation has been completed, there are issues around its operation and management. These include the type of staff who will manage it, development of appropriate management policies, such as security and grievance procedures, and ongoing liaison with local communities. All such policies should be subject to regular review.

3 DESCRIPTIONS OF THE PROJECT

3.1 The Project

The proposed 100 MW ac solar power project located in the village of Bhabanipur in the Hemayetpur Upazila which is south-west outskirts of Pabna City, in Pabna District, central Bangladesh. The project is planned on a Build, Own, and Operate (BOO) basis under the Implementation Agreement (IA) with the Government of Bangladesh (GoB). The proposed project requires 400 acres of land [for the main power plant, substation area, worker camp, construction / laydown area]. The proponent has already acquired 229 acres of land till August 2023 and the rest of the land is under acquisition process which will be acquired within September 2023. Proposed transmission line is 21.5 km from Hemayetpur to Ishwardi.

DSEPL will design, engineer, manufacture, finance, construct, complete, test, commission, insure, own, operate and maintain the plant for the purpose of generating and supplying electricity to Bangladesh Power Development Board (“BPDB”) for a period of 20 years on an off-take basis.

Table 3.1: The Basic Data of 100 MW ac Solar Power Project

1. Name of the Project	100 MW ac Solar Power Plant
2. Project Proponent	Dynamic Sun Energy Private Limited
3. Project Location	Bhabanipur & Ratanpur Mauza, Hemayetpur Union, Pabna Sadar Upazila, Pabna, Bangladesh
4. Fuel Type	Sunlight
5. Plant Type	Solar Power Plant
6. Net Plant Capacity	100 MW
7. No. of Solar PV Module	2,74,224 nos.
8. No. of Grid Tied Inverter	760 nos.
9. No. of Transformers	Total 36 nos.
10. Total Land Area	400 acres for power plant 0.7642 acres for tower footing area
11. Transmission line	21.5 km from Hemayetpur to Ishwardi
12. Transmission tower	79 nos.
13. Total Manpower	Construction phase: 700 persons (200 residential and 500 non-residential) Operation phase: 550 persons (200 residential and 350 non-residential), see Annexure 5
14. Water Requirement	Construction phase: Domestic purpose 86 m ³ /day from groundwater Operation phase: Domestic purpose 71 m ³ /day from groundwater and PV module cleaning (twice) 2742 m ³ /month from rain harvesting

15. Power Evacuation System	Generated electricity will be evacuated through BPDB's 230/132 kV substation situated at Joynagar, Ishwardi, Pabna.
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3.2 Location of the project

The Proposed Power Plant is located at Bhabanipur and Ratanpur Mauza in Hemayetpur Union. The proposed electricity transmission line has started from the proposed solar power plant (Bhabanipur, Hemayetpur Union) to existing 230/132 KV Grid PGCB Sub-station at Joynagar, Ishwardi, Pabna which is 21.5 km long and contains 79 towers. The width of the RoW has been considered as 10m along the TL and allowable height clearance is 8m from lower conductor. This power transmission line will pass over Bhabanipur, Bhagiratpur, Bilkeda Khas, Khas Char Bagunda, Char Pratappur, Char Kudulia, Shimul Char, Ratanpur Mouza of Pabna Sadar Upazila and Dadapur, Joynagar, Kamalpur, Kaikunda, Maniknagar, Luxmikunda, Sahapur and Char Silimpur Mouza of Ishwardi Upazila. The project site is about 8.79 km from Pabna Sadar Upazila and 125.87 km from Dhaka.

South and West side of the project area is surrounded by a branch of Padma River. Bhabanipur Upazila is located on the North and Ghoshpur on the East side. Pabna Medical College is only 6.5 km and Pabna Mental Hospital is only 6.0 km from the project site.

The project location in District map and Upazila map are presented in **Figure 3.1** and **3.2** respectively. The power plant area with transmission line is shown in **Figure 3.3**.

3.3 Accessibility to Project Site

There is a good roadway accessibility from Dhaka to Pabna Bus Terminal through highway. Then local easy bikes, battery-run rickshaw and vans are available to reach the Project Site from Pabna Bus Terminal. The connected road from Pabna Bus Terminal to Heliboard Bazar is of 15ft wide and is bitumen road. After that the road is quite narrow, undulated, zigzag and kacha till the project site. The width of that kacha road is about 10-12 ft varies from place to place. It takes more than 45 minutes to reach the project site from the Bus Terminal.

The road connectivity of the project site from Dhaka city and Pabna Sadar Upazila is shown in **Figure 3.4** and **3.5** respectively.

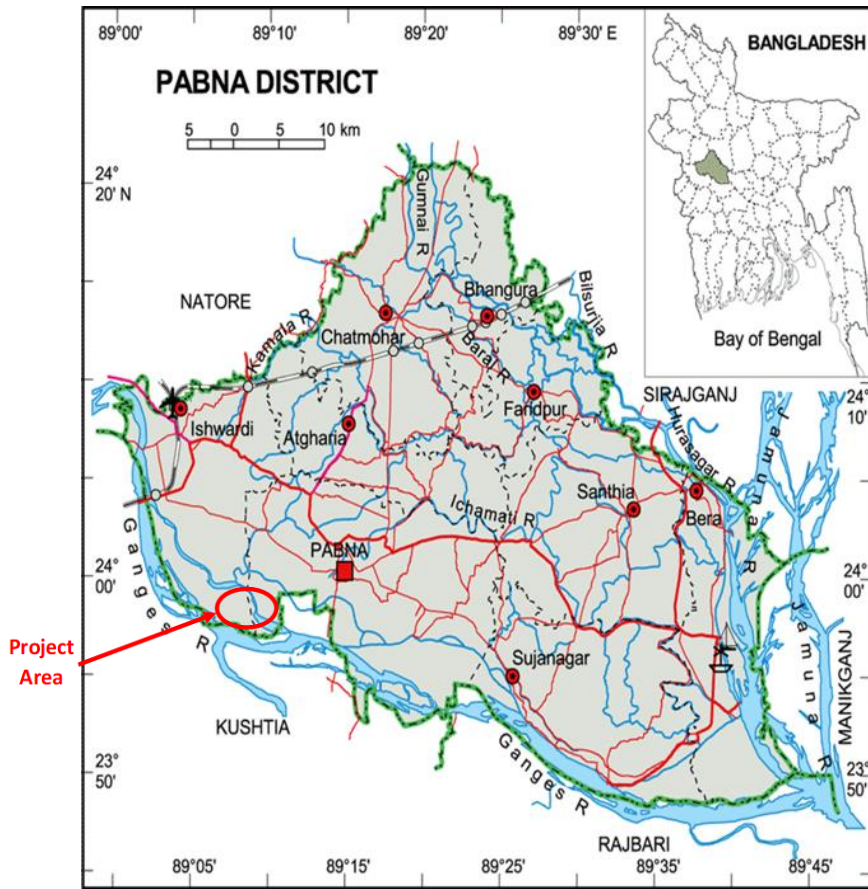


Figure 3.1: Pabna District Map

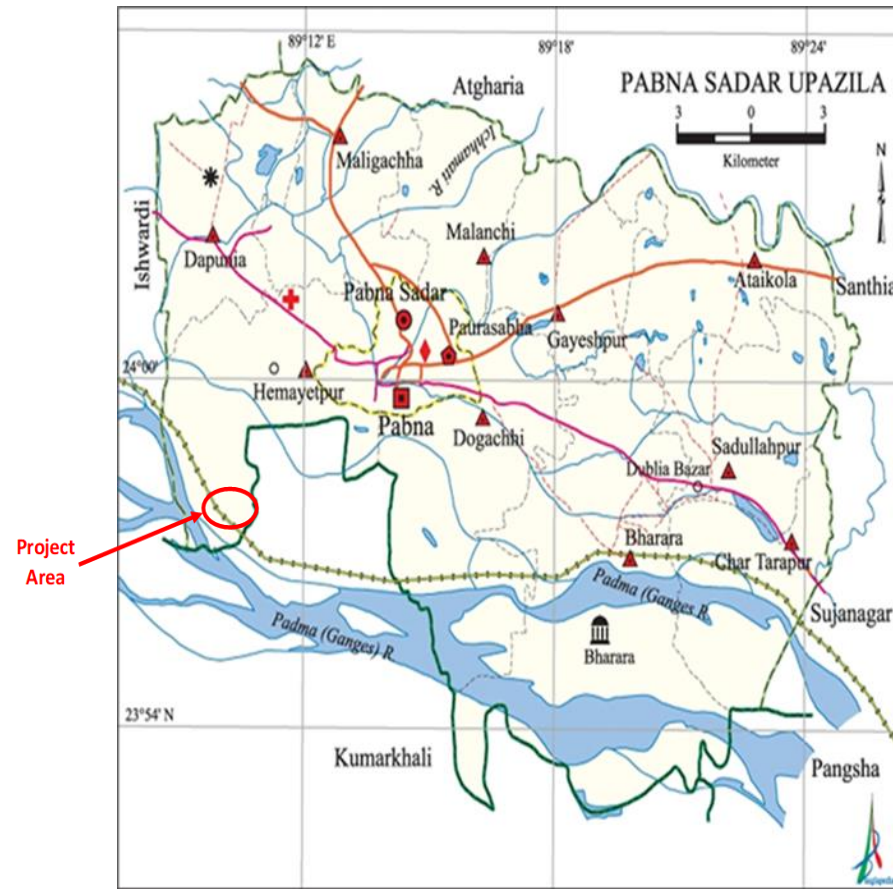


Figure 3.2: Pabna Sadar Upazila Map

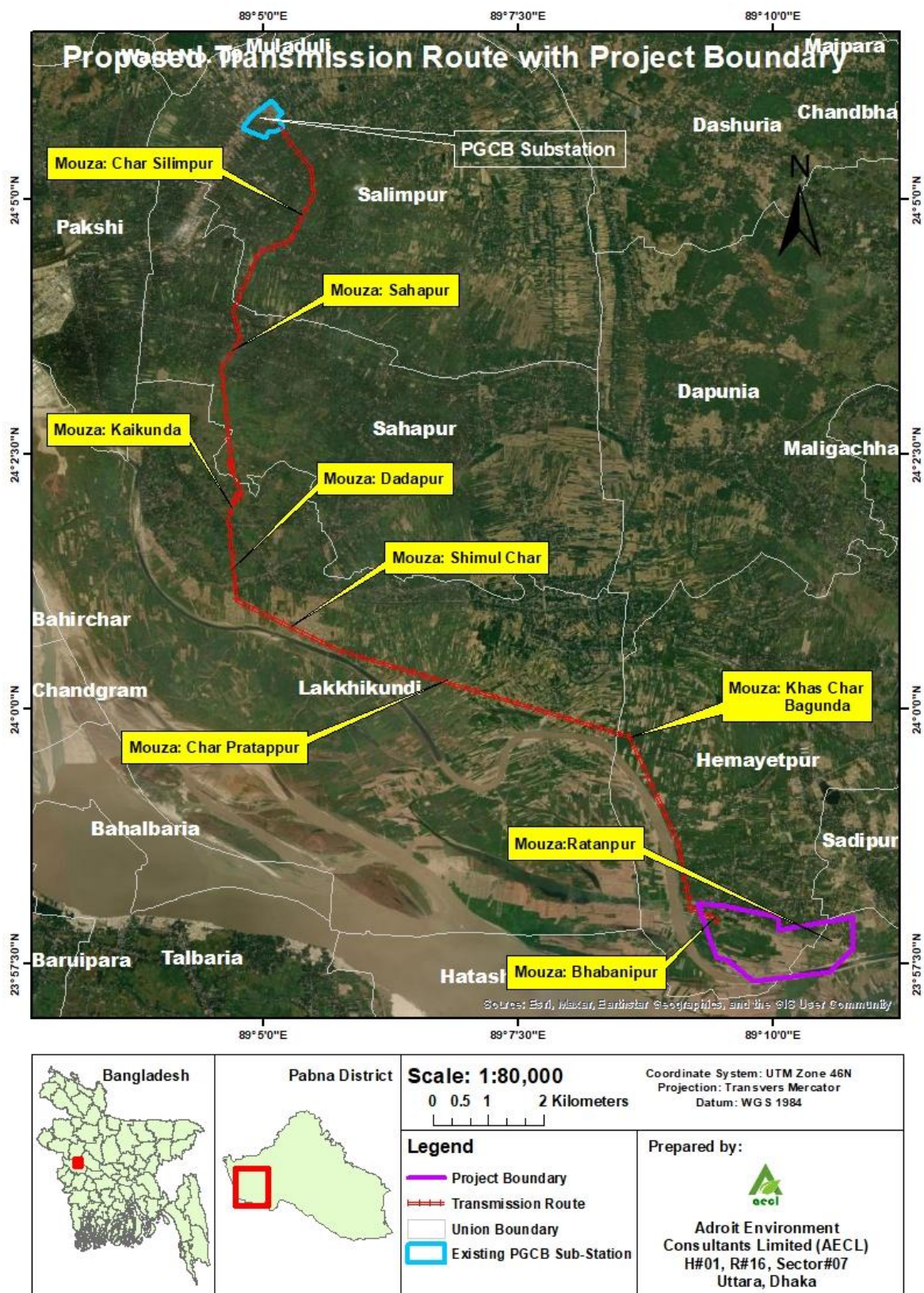


Figure 3.3: Project Location Map

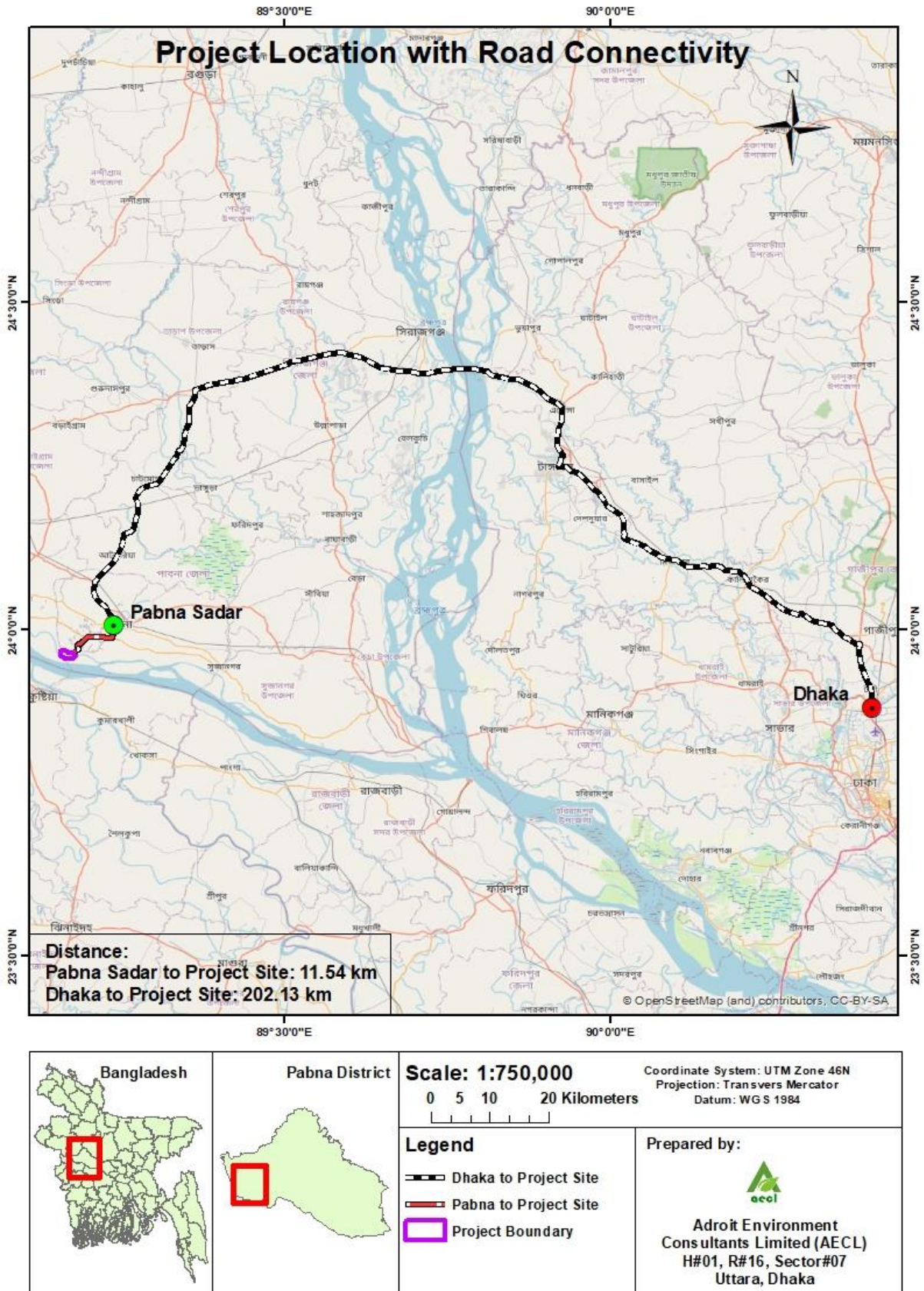


Figure 3.4: Project location with road connectivity from Dhaka city.

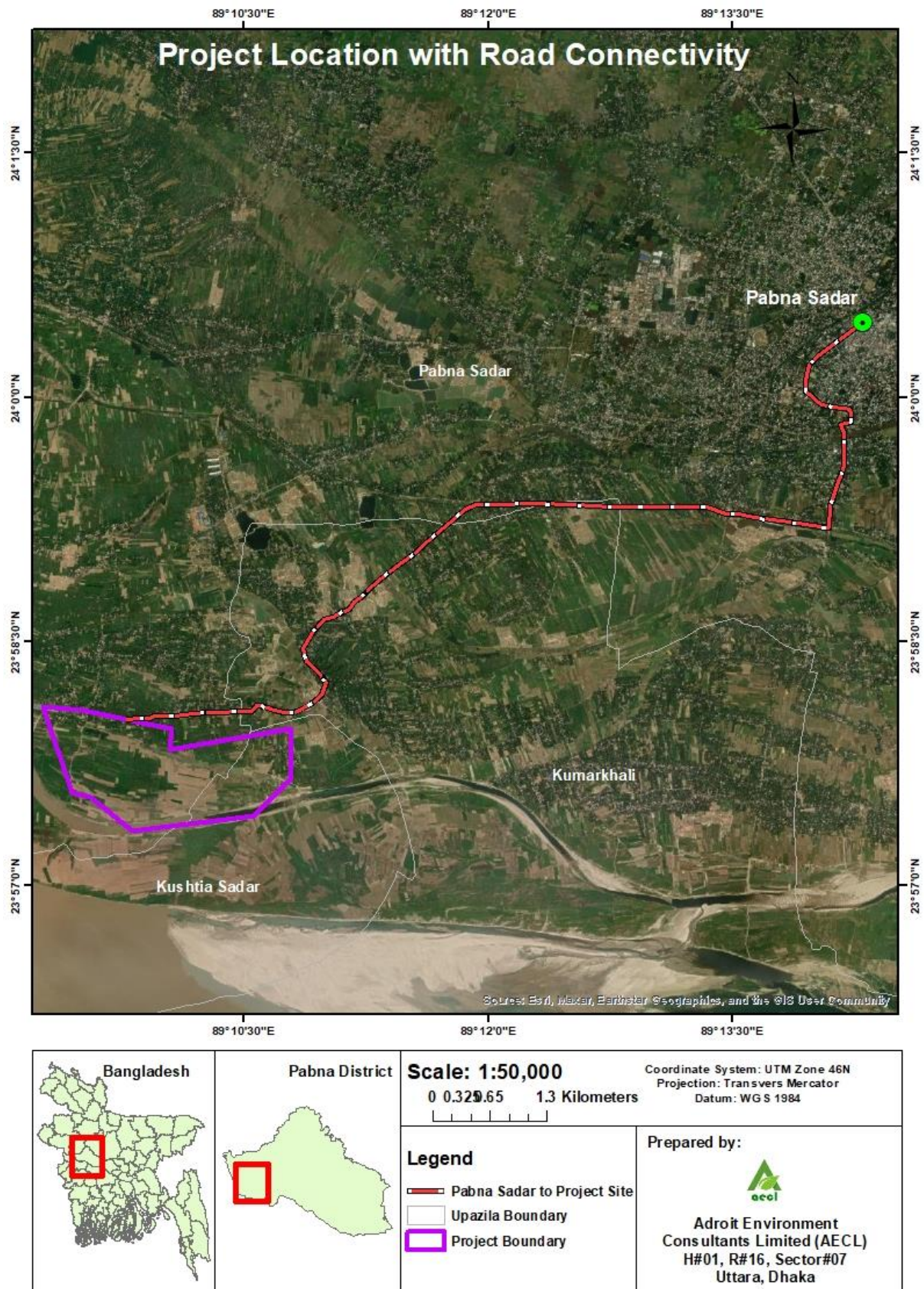


Figure 3.5: Project location with local road connectivity from Pabna Sadar Upazila.

3.4 Present Site Condition

3.4.1 Power Plant Area

The project site is located in Bhabanipur which is mainly a char land, at the side of the Padma river. There is no industry and factory around the project site. A khal³ originated from the Padma River is located adjacent to the southern side boundary of the project site and 0.5 km away from the west side boundary of the project. There is a guchha gram at the north-west side of the project area. The width of this khal varies from 100m to 130m. During monsoon season the local khal has very low flow but during dry season it becomes dry. Padma River is passing to the south side of the project area which is about 1.5 km from the project site.

According to the layout map (Figure 1 and Annexure 2) there will be office buildings, main substation control building, block sub-station building within the project area. Dormitory building, family quarter, swimming pool, playground, officer's club, children park, mothers' waiting zone, mosque, helipad will be at east side of the project area.

Now the project is under construction phase and already construction of sub-station building, office building, dyke or boundary road, pile driving work etc. are going on. There are temporary office buildings, labour shed, medical room, child care facility, kitchen, dining, sanitation facility, septic tank, water treatment plant, parking area, internal earthen road etc. facilities present at the site. Existing temporary office buildings and labour shade has been shown in the layout in **Figure 3.7**. 3D view of the project is shown in **Figure 3.8**.

According to the site elevation map (attached as Annexure 3) the highest elevation of the power plant site is 13.162m and lowest elevation is 7.487m. According to the Flood Study and Mitigation Report (attached as Annexure 4), the maximum water elevation for 10-year and 100-year ARI due to overtopping of Padma River is EL. 13.98 m PWD and EL.15.04 m PWD respectively and maximum water elevation for 100-year ARI due to flood from local rain is EL.12.3 m PWD. The land elevation has been kept as 12.3 m PWD using cutting and filling method within the project boundary. The entire land has already been developed. The elevation of lower and upper side of the PV panel will be at 15.485 m and 16.50 m above sea level respectively. For flood management DSEPL will construct dyke/ elevated road (Elevation 14.0 mPWD) around the project boundary which will act as Cofferdam (Figure 3.6 (b)). The dyke will be made of sand and geotextile. There will be flap gates (one-way drains) and pumps along the dykes. The one-way drains will discharge the flood water from inside the power plant area to the outside if the inside water level is above the outside flood water level. If the flood water level outside is higher than the inside only in that case pumps will be used. Internal drainage and

³ A natural creek, pool, or tank with a passage of inflow and outflow of water which is connected with a nearby river or waterbody

water discharge plan is attached as Annexure 25. This year the monsoon season has already passed and there was no flooding. The construction of the Boundary Road/dyke is ongoing and will be completed before the next monsoon period. The new drainage study (attached as Annexure 25) shows that there will be ditch on the north side of the power plant connected to the southern sumps to dispose the extra water from community flooding so that, the water can't cause any flood to the community area. Ditch no. 6, 7, 8 and 9 will be responsible to dispose the water of the community water shed which has been denoted as catchment area 14, 15 and 16. Details of the proposed ditch for flood water disposal is provided below:

Table 3.2: Ditch Type and Specifications

Type	Section	Side Slopes	Depth (m)	Base (m)
6	Trapezoidal	1V:2H	0.90	0.90
7	Trapezoidal	1V:2H	1.00	1.00
8	Trapezoidal	1V:2H	1.10	1.10
9	Trapezoidal	1V:2H	1.10	4.90

The land elevation has been kept as 12.3 m PWD using cutting and filling method within the project boundary. The entire land has already been developed. Both internal cutting sand and external sand has been used for land development work. To raise the main power plant site at elevation 12.3m total 71555m³ sand was required where 67591 m³ was procured from cutting of the main power plant site. additional 3964m³ was outsourced. In addition to that, 50300 m³ (36575m³ + 13725m³) was outsourced for platform development of substation and main control room and 156522 m³ (135966m³ + 20556m³) was outsourced for dyke and internal road development. In total, 210786 m³ sand was outsourced. Please see Annexure 26 & 27. The sand is transferred by vessel to the nearest khal and then the sand is pumped to the power plant site through overland pipes. The pipelines are temporary and laid over the land for sand transfer.

Project proponent has distributed the project area into 15 Blocks. The solar panel will be mounted on tables and each table will be mounted on 10 PHC piles. 58 numbers of PV panels will be mounted per single table. There will be total 4728 tables and 48600 PHC piles. About 10775 piles out of 48600 have already been driven. About 5.6 m of the pile will be driven below the ground and 3.4 m will be above the ground. The elevation of lower and upper side of the PV panel will be at 15.485m and 16.50m respectively. Some solar panel has been installed in a trial basis to identify the yield of them in developed land. The project site is a vacant land with no settlements, but a small area is currently in use for banana cultivation for only this season. Fencing of 258.5 acres are has been completed. The project site is located on non-agricultural Char land and the proponent has already purchased 229 acres of land till August 2023 through willing buyer and willing seller method and the rest of the land is under process which will be purchased within September 2023. Total 315 number of plots are at main power plant site and DSEPL has purchased plots to date is 254 numbers. A total of 1054 households (HHs) and 3693 population will be affected due to land purchase of main power plant site. Land acquisition information is given in Annexure 6.

3.4.2 Transmission Line Area

The length of the transmission line is 21.5km and the transmission line from the power plant area will be stringed above the ground through transmission towers and toward the last end (near substation) about 0.5 km will go under the ground. Memorandum of understanding (MoU) has been made with the land owners for the land area of the transmission tower and compensation has been given to the project affected people for Row, standing crops and for access to the site. Already footing area for 76 towers has been purchased till August 2023 and only purchase of 3 transmission tower footing areas are under process. The construction of tower footing area has been started and out of 79 transmission towers 75 have been completed. A total of 79 HHs comprises of 257 people with average HH size 3.25 will be affected due to land acquisition of the transmission tower footing. The proponent has entered into a contract with JV of DRS-EPBL-Mukti for transmission line construction activity. They are using cast in situ piles for transmission tower base. There will be two types of towers i.e., angle tower and suspension tower. For each angle tower 8 piles are casted and for each suspension tower 16 piles are casted for the construction of footing of the towers. Construction of angle tower footing takes 7~10 days and suspension tower footing take 4~5days. After completing the construction of each tower footing, the contractor cleans up and reinstate the site before leaving. During the construction of tower footing the DSEPL to ensure environmental and social compliance. The adjacent land area of the transmission line is predominantly agricultural (one crop land area) type. Once in a year local people cultivate crops on this land. After Commissioning of the 132kV Transmission Line, PGCB will be responsible for operation & maintenance of the transmission Line. DSEPL will be responsible for coordination & liaison with PGCB O & M team to ensure uninterrupted power evacuation from the DSEPL Solar Power Plant. Land acquisition information is given in Annexure 6.

Photographs of project site and transmission area is given in **Figure 3.6 (c)**.



East Side



South Side



South-western Side



North Side



West Side



North - Western Side

(a) Project Site



West Side



North Side



East Side



Adjacent Khal and Project Boundary



South Side



Dyke, Project Boundary and Adjacent Khal

(b) Around the Project Site



North Side



East side



North - Eastern Side



South Side



West Side



South - Eastern Side

(c) Transmission Route



Nameplate



North Side



East Side



North-western side



South Side



South-eastern side

(d) PGCB Sub-Station, Ishwardi

Figure 3.6: Surrounding Picture of the Project Site

3.5 Project Component

A brief of project component & equipment are given in table below:

Table 3.3: Project Information

SERIAL NO.		Project Segment	Total QTY./WORK VOLUME	Location Address	Segment Category	
A	LAND	A1	Main Power Plant Land	400 Acres	Inside the Project Map	Project Component
B	CIVIL WORK	B1	Foundation for 132kV AIS Switchyard [PLANT END]	3.0 Acres / 120 Nos. Pile	Inside the Project Map	Project Component
		B2	Foundation for 132kV AIS Switchyard [PGCB END]	15 Sq. Meter / 120 Nos. Pile	Inside the PGCB Grid Substation, Joynagar, Iswardi	Project Component
		B3	Main Control Building	Full Package (61000 SFT)	Inside the Project Map	Project Component
		B4	Mini Sub Station Building	31Nos. X (each 1500 SFT)	Inside the Project Map	Project Component
		B5	Administrative Office Building	1	Inside the Project Map	Project Component
		B6	Dormitory Building	1	Inside the Project Map	Project Component
		B7	Plant Internal Road	Full Package	Inside the Project Map	Project Component
		B8	River Embankment & Boundary Fencing	5.5km	Project Boundary River Side	Project Component
		B9	Septic Tank, Soak Well & STP	2 Septic tanks, capacity of each septic tank is 26.5 m ³ . STP of capacity 40 m ³ /day	Inside the Project Map	Project Component
		B10	Water Drainage Network	Full Package	Inside the Project Map	Project Component
		B11	Rain Water Harvesting Pond	7 Nos. Pond	Inside the Project Map	Project Component
		B12	132KV Transmission Line Tower Foundation	79 Nos.	Out Side the Project Map	Project Component
		B13	PHC Pile	47280 Nos.	Inside the Project Map	Project Component

SERIAL NO.		Project Segment	Total QTY./WORK VOLUME	Location Address	Segment Category	
C	TL	C1	132KV Transmission Line Tower	79 Towers	Out Side the Project Map	Project Component
		C2	Stringing Conductors	21.0km	Out Side the Project Map	Project Component
		C3	132KV Under Ground Line	0.580km	Inside the PGCB Grid Substation, Joynagar, Iswardi	Project Component
D	PV AREA	D1	MMS (Module Mounting Structure)	4728 tables	Inside the Project Map	Project Component
		D2	PV MODULE	274224 Nos.	Inside the Project Map	Project Component
		D3	DC cable	1300km	Inside the Project Map	Project Component
		D4	33kV XLPE cable	86km	Inside the Project Map	Project Component
		D5	Mesh Earthing & LPS in PV Area	350km	Inside the Project Map	Project Component
		D6	INVERTERS	744 Nos.	Inside the Project Map	Project Component
		D7	33kV SUBSTATION & SWITCHGEAR PANEL	31 Set	Inside the Project Map	Project Component
E	SUBSTATION	E1	132kV Feeder Bay Extension [PGCB END]	Double Ckt (Full Package)	Inside the PGCB Grid Substation, Joynagar, Iswardi	Project Component
		E2	132kV AIS Switchgear, and POWER TRANSFORMER	Double Ckt (Full Package)	Inside the Project Map	Project Component
		E3	110Vdc Battery Banks and Charger Set	2 Set	Inside the Main Substation Building	Project Component
		E4	33kV GIS Switchgear Panel	43 Sets	Inside the Main Substation Building	Project Component
		E5	33kV RMU & 33/0.415kV Transformers	31 Sets	Inside the Block Substation Building	Project Component

SERIAL NO.		Project Segment	Total QTY./WORK VOLUME	Location Address	Segment Category	
	E6	SCADA & PPC	1 Lot	Inside the Main Substation Building	Project Component	
	E7	Cable Tray	Full package	Inside the Main Substation Building	Project Component	
F	BOP	F1	Weather Station	16 Nos.	Inside the Project Map	Project Component
		F2	Fire Protection System	Full Package	Inside the Project Map	Project Component
		F3	Plant Illumination System	Full Package	Inside the Project Map	Project Component
		F4	LPS	Full Package	Inside the Project Map	Project Component
		F5	BSDG	2 Sets	Inside the Project Map	Project Component
		F6	CC Camera & Surveillance Camera System	Full Package	Inside the Project Map	Project Component

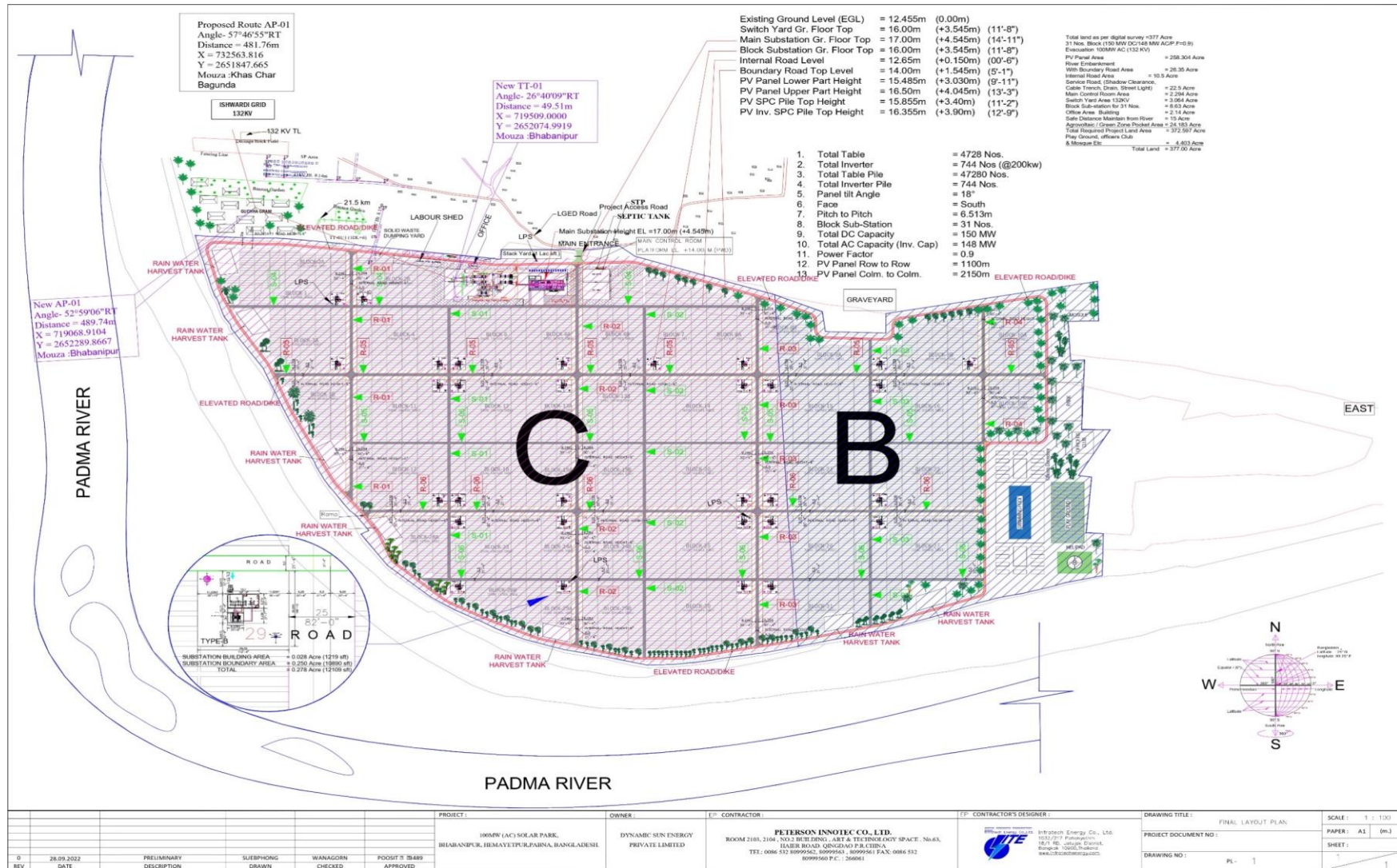


Figure 3.7: Layout of Project Area



Figure 3.8: 3D view of the project

3.6 Project Detail

The proposed power plant will be installed to serve uninterrupted electricity to the national grid. Dynamic Sun Energy Private Ltd. is going to generate and supply electricity to Bangladesh Power Development Board (“BPDB”) for a period of 20 years on an off-take basis.

3.6.1 Solar PV Module

Detail of Solar PV module is presented below in **Table 3.4 & 3.5** and a layout is given on **Figure 3.9**.

Table 3.4: Mechanical Parameters of Solar PV Module

Mechanical Parameters	Specifications
Supplier	JA Solar Technology Co. Ltd.
Cell	Mono
Weight	31.2 kg
Dimension	2278±2mm x 1134±2mm x 35±1mm
Cable Cross Section Size	4mm ² (IEC), 12 AWG (UL)
No. of cells	144 (6x24)
Junction Box	IP68, 3 diodes
Connector	MC4-EVO2/ QC 4.10-351
Cable Length (Including Connector)	Portrait: 200mm (+)/300mm (-); Landscape: 1300mm (+)/1300mm (-)
Front Glass/Back Glass	2.0mm/2.0mm
Packaging Configuration	36pcs/Pallet 720pcs/40HQ Container

Table 3.5: Operating Parameters of Solar PV Module

Operating Parameters	Specifications
Maximum System Voltage	1500V DC
Operational Temperature	-40°C ~ +85°C
Maximum Series Fuse Rating	30A
Maximum Static Load, Front	5400Pa (112 lb/ft ²)
Maximum Static Load, Back	2400Pa (50 lb/ft ²)
Nominal Operating Cell Temperature	45±2°C
Bifaciality	70%±10%
Fire Performance	UL type 29

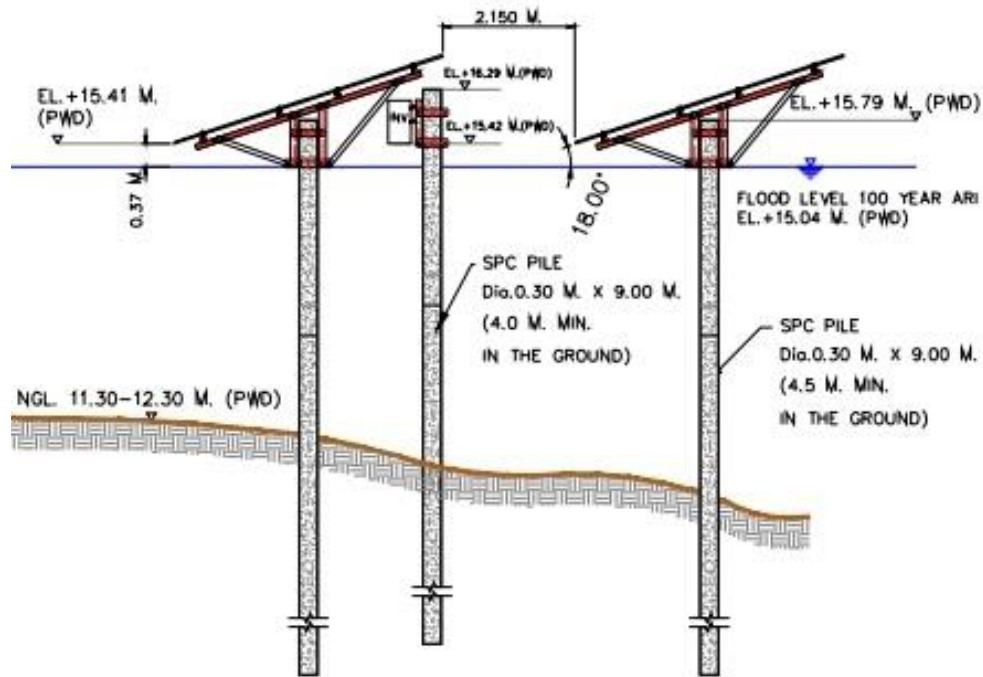


Figure 3.9: Layout of the PV Panel

3.6.2 Inverter

Table 3.6: Technical data of Inverter

Technical Parameters	Specifications
Efficiency	
Max. Efficiency	99.00%
European Efficiency	98.60%
Input	
Max. Input Voltage	1500V
Max. Current per MPPT	30 A
Max. Short Circuit Current per MPPT	50 A
Start Voltage	550 V
MPPT Operating Voltage Range	550 V ~ 1500 V
Nominal Input Voltage	1080 V
Number of Inputs	18
Number of MPP Trackers	9
Output	
Nominal AC Active Power	200,000 W
Max. AC Apparent Power	215,000 VA
Max. AC Active Power (cosφ=1)	215,000 W
Nominal Output Voltage	800 V, 3W + PE
Rated AC Grid Frequency	50 Hz / 60 Hz
Nominal Output Current	144.4 A

Technical Parameters	Specifications
Max. Output Current	155.2 A
Adjustable Power Factor Range	0.8 LG ... 0.8 LD
Max. Total Harmonic Distortion	<3%
Protection	
Input-side Disconnection Device	Yes
Anti-islanding Protection	Yes
AC Overcurrent Protection	Yes
DC Reverse-polarity Protection	Yes
PV-array String Fault Monitoring	Yes
DC Surge Arrester	Type II
AC Surge Arrester	Type II
DC Insulation Resistance Detection	Yes
Residual Current Monitoring Unit	Yes
Communication	
Display	LED Indicators, WLAN + APP
USB	Yes
MBUS	Yes
RS485	Yes
General	
Dimensions (WxHxD)	1035x700x365 mm (40.7x27.6x14.4 inch)
Weight (with mounting plate)	≤86kg (189.63 lb)
Operating Temperature Range	-25°C ~ 60°C (-13°F ~ 140°F)
Cooling Method	Smart Air Cooling
Max. Operating Altitude without Derating	4000 m (13123 ft)
Relative Humidity	0 ~ 100%
DC Connector	Staubli MC4 EVO2
AC Connector	Waterproof Connector + OT/DT Terminal
Protection Degree	IP66
Topology	Transformer less

3.6.3 Transformer

Table 3.7: Technical data of Transformer

GENERAL TECHNICAL DESCRIPTION			
1	Manufacturer type	:	ORF 120/275
2	Standard	:	IEC 60076
3	Frequency/ phase	:	50 Hz / 3 Phase
4	Installation	:	Outdoor
5	Altitude above sea level (m)	:	< 1000
6	Type of cooling	:	ONAN/ONAF
7	Rated power (MVA)	:	80/120
8	Connection symbol	:	YNd11
9	Nominal ratio of transformation (kV)	:	132/33
10	Insulation class of windings	:	A
11	Winding conductor material	:	Copper
12	High voltage winding	:	
	- Highest voltage for equipment/Neutral (kV)	:	145/17.5
	- Power frequency withstand voltage (kV)	:	275/38
	- Full wave lightning impulse voltage (kV peak)	:	650/95
	- Winding connection	:	Star
	- Type of termination	:	Outdoor
13	Low voltage winding	:	
	- Highest voltage for equipment (kV)	:	36
	- Power frequency withstand voltage (kV)	:	70
	- Full wave lightning impulse voltage (kV peak)	:	170
	- Winding connection	:	Delta
	- Type of termination	:	Air Filled Cable box
14	Uniform/ graded design of	:	
	- High voltage winding	:	Graded Insulation
	- Low voltage winding	:	Uniform Insulation
15	Tap changing device	:	On Load tap changer
16	Tapping regulation range (%)	:	+12x1.25 % to -12x1.25 %
17	Category of tapping voltage variation	:	Constant flux voltage variation
18	No load loss at rated voltage, rated frequency (kW)	:	54
19	Load loss at rated ratio, 75 °C, 120 MVA (kW)	:	380
20	Impedance at nominal tap, 75 °C, 120 MVA (%)	:	14
21	Short circuit duration (IEEE Standard) (second)	:	2
22	Maximum permissible temperature rise	:	
	- Top oil (by thermometer) (°C)	:	55
	- Average winding (by resistance) (°C)	:	65; HS : 75
23	Sound Pressure Level	:	
	- ONAN rating at 1 m (dB)	:	70
	- ONAF rating at 2 m (dB)	:	80
24	Overall dimension (approximately)	:	
	- Length (mm)	:	8000

GENERAL TECHNICAL DESCRIPTION			
	- Width (mm)	:	5500
	- Height (mm)	:	6400
25	Untanking part (kg)	:	6600
26	Oil weight (kg)	:	25000
27	Total weight (kg)	:	123400
28	Maximum transport weight (kg)	:	106000
ACCESSORIES DATA			
1	On load tap changer	:	MR VM III 650Y
2	Motor drive unit	:	MR – ED 100
3	Off circuit tap changer	:	NA
4	Over pressure relief device :	:	-
	-for main transformer tank	:	Messko or equiv.
	-for OLTC diverter tank	:	Messko or equiv.
5	Gas actuated (Buchholz) relay	:	Taijin/Maier or equiv.
6	Protection relay for OLTC with trip contact	:	MR – RS2001
7	Magnetic oil level indicator	:	-
	- for main conservator	:	Elmek/Maier or equiv.
	- for OLTC conservator	:	Elmek/Maier or equiv.
8	Oil temperature indicator	:	Messko or equiv.
9	Winding temperature indicator	:	Messko or equiv.
10	Painting in accordance with EEI standard painting system	:	Epoxy base painting
11	Transformer oil in accordance with IEC 296	:	
12	Transformer base	:	Skid base
13	Lifting lugs, jacking bosses, towing lugs and earthing tmnl.	:	Provided
14	Oil valves		
	- Filter valves (sluice type)	:	Provided
	- Sampling valves (sluice type)	:	Provided
	- Drain valve on tank (sluice type)	:	Provided
	- Shut-off valve between buchholz and conservator	:	Provided
	- Butterfly valves between radiators and tank	:	Provided
15	Thermometer pocket DIN 42553	:	Provided
16	Rating & schematic plate	:	Provided
17	Oil preservation system	:	Provided
18	Arrangement of cooler	:	
19	Impact recorder for transport	:	Provided
LIST OF TESTS			
Routine Test			
1	Measurement of winding resistance	:	Yes
2	Measurement of voltage ratio and check of phase displacement	:	Yes
3	Measurement of short circuit impedance and load loss	:	Yes
4	Measurement of No-Load Loss and Current	:	Yes
5	Lightning impulse test	:	Yes

GENERAL TECHNICAL DESCRIPTION			
6	Applied voltage test	:	Yes
7	Induce voltage withstand test	:	Yes
8	Partial Discharge	:	Yes
	Test on load tap changer, where appropriate	:	Yes
9	Leak testing with pressure	:	Yes
10	Check of the ratio and polarity of built-in current transformers	:	Yes
11	Check of core and frame insulation	:	Yes
12	Determination of capacitances windings-to-earth and between windings	:	Yes
13	Measurement of D.C. insulation resistance between each winding to earth and between windings	:	Yes
14	Measurement of dissipation factor ($\tan \delta$) of the insulation system capacitances	:	Yes
15	Measurement of dissolved gasses in dielectric liquid from each separate oil compartment except diverter switch compartment	:	Yes
16	Measurement of no-load loss and current at 90 % and 110 % of rated voltage	:	Yes
Type Test			
1	Temperature-rise type test	:	Yes
2	Dielectric type tests	:	Yes
3	Determination of sound level	:	Yes
4	Measurement of the power taken by the fan	:	Yes
Special test			
1	Measurement of zero-sequence impedance	:	Yes
2	Measurement of frequency response (Frequency Response Analysis or FRA)	:	Yes

3.6.4 SPC-Pole Specification

Table 3.8: Technical data of Transformer

SPS/PHC Pile in PV Module Area		
Description	External	Internal
Amount (No.)	14160	33120
Length (m.)	9.0	9.0
Diameter (mm.)	300	300
Wall thickness (mm.)	70	70
No. of pre-stressed steel	10 dia. 9 mm.	7 dia. 7 mm.
Crack Moment (KN. m)	42.0	28.0
Weight (Ton)	1.2	1.2
Concrete		
Min. Compressive F_c' , MPa (cube)	70	70
Young's Modulus (MPa)	40000	40000
Bending Strength	7	7
Steel Bar		

SPS/PHC Pile in PV Module Area		
Description	External	Internal
PC bar diameter (mm.)	9.0	7.0
Ultimate Tensile strength (MPa)	1420	1420
Yield Strength	1280	1280

3.7 Resources and Utilities Demand

3.7.1 Electricity

During construction phase electricity from Palli Bidyut (a subsidiary of Bangladesh Rural Electrification Board (BREB) and supplies electricity to rural areas of Bangladesh) is used and during operation phase own generated power will be used for plant and its associated facility operation.

3.7.2 Water

There are around 700 laborers working during construction phase among them 200 are residential and 500 are non-residential. They require 86 m³/day of water considering 180 liter/day/capita for residential worker and 100 liter/day/capita for non-residential worker consumption. From the baseline study it was found (Table 4.15) Lead (Pb) and Cadmium (Cd) of the ground water sample is beyond the Bangladesh drinking water standard value extracted from shallow tube well. The depth of the sampled tube well at project site was 70 ft. DSEPL had treatment facility at site for treating ground water for drinking purpose. Right now, they have drinking water treatment facility at site for the supply of drinking water for the labours and its officials. DSEPL has set up new submersible pump at 220 ft depth along with water treatment plant (WTP) which can treat 1000 litres of drinking water per hour (24m³/day) for the supply of drinking water for the rest of the construction period and operation phase ahead. Water sample testing results of the new treatment facility is attached as Annexure 10 and all the parameters (pH, Color, Turbidity, Total Hardness, Cl, TDS, Mn, As, Fe, TC, FC, Total Alkalinity, SO₄, Nitrate, Cr, Pb, Cd, Zn, Cu) of the supplied drinking water is well within Bangladesh and WHO drinking water standards.

During operation phase, ground water and rainwater harvesting ponds will be used. There will be around 550 laborers working during operation phase among them 200 will be residential and 350 will be non-residential. They will require 71 m³/day of water considering 180 liter/day/capita for residential worker and 100 liter/day/capita for non-residential worker consumption. Approximately 2742 m³/month of water will be required for PV modules cleaning during operation phase. Total capacity of the 7 rainwater harvesting ponds is 22750.00 m³ and according to the water balance calculation which includes estimated seasonal rainfall data, the rainwater harvesting ponds will provide sufficient PV panel cleaning water storage all through the year. Water balance diagram is attached as Annexure 7.

3.7.3 Fuel

Approximately 2000 liters of diesel is required per month for emergency backup by Generators and 1000 litres per month octane is required for the vehicles. DSEPL requires permission from Bangladesh Energy Regulatory Commission (BERC) and DC office for storing diesel at site. Generators are refilled onsite. DSEPL procure diesel and octane from diesel pump stations. Diesel is brought to the site in drums and then refilled to the generators. Vehicles are not refilled onsite. During construction phase, there will be 3 nos. of DG Sets (60kVA, 100kVA & 150kVA) are available for emergency purposes. During operation phase, there will be 2 nos. of DG Sets for emergency purpose. Capacity of each DG Set will be 630kVA. For storing fuel at site for backup generators, DSEPL requires to take approval from Bangladesh Energy Regulatory Commission (BERC) and the application to BERC by DSEPL is attached as Annexure 35. There is no threshold value for storing Fuel at site.

3.7.4 Infrastructure (road, drains)

The project location is beside the existing LGED Road (see Annexure 2 Figure 3.7). A 200m herringbone road has been constructed and developed for accessing the Project from the nearby LGED Road. No land was acquired for this purpose and this 200m long access road is constructed on DSEPL's own land by themselves. This 200m access road is not accessible to local people. The LGED Road starts from the Pabna Highway and runs through Heli board Bazar to Project Site. The road is bituminous road up to Bhabanipur and after that the rest of the LGED road is earthen and damaged. DSEPL has improved the quality of road for the transportation of the constructional materials, machineries, and equipment. The width of this roads is almost 10-12 ft. Normally local vehicles i.e., motorcycles, easy bikes and auto rickshaw runs along the road. No heavy traffic or transport is seen at this road. DSEPL uses pilot car and flushing lighting system for carrying the Solar PV mounting piles by large lorries through local narrow roads from the nearest highway to the project site as local people are not habituated with this kind of heavy vehicles. There will be internal roads within the project area for regular movement of the project personnel. According to the Flood Study and Mitigation Report, elevation of the internal roads will be 12.65 m. Natural drainage system is available (khal) around project site. There will be box culverts and internal drains for internal drainage. In addition to that flap gates will be installed along the boundary line which are one-way gate. During flooding, excess water will be discharged to the adjacent canal but no water from outside can move in through it. Internal drainage and water discharge plan is attached as Annexure 25 with outflow points which are all along the southern boundary of the main power plant site.

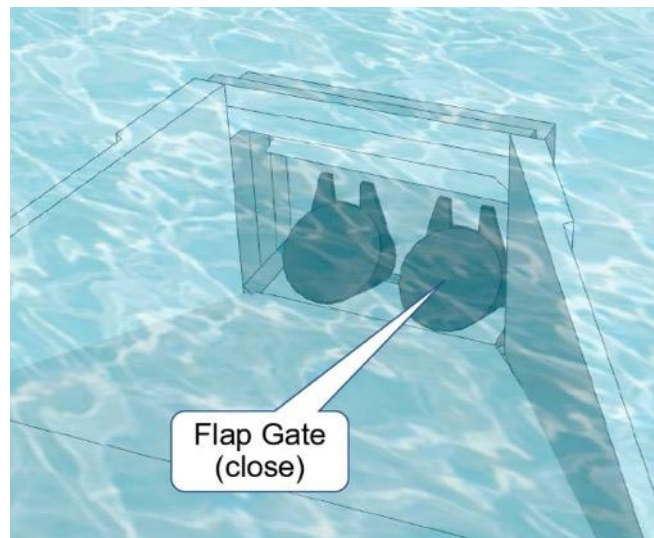


Figure 3.10: Flap gates

3.8 Adaptation / Enhancement/ Abatement Measures

3.8.1 Climate change and adaptation measures

As the project site is beside the Padma River so there is vulnerability of flooding due to overtopping of Padma River and local rain. The proponent already conducted Flood Study and Mitigation Report and designed the power plant according to the study so that during the 100 years return period the solar PV panels, transformers and substations are above the flood level. In addition to that, flood dyke will be constructed with freeboard to protect PV module from Flooding in 100-year ARI. The elevation of lower and upper side of the PV panel will be at 15.485m and 16.50m respectively. The elevation of main sub-station building will be 17.0 m, block sub-station will be 16.0 m. The boundary road / dyke will be used for flood protection (dyke) from the overtopping of the Padma River and flooding due to rainfall. The dyke will be made of sand and geotextile to prevent any kind of seepage. No concrete structures will be made for boundary road/dyke. Details shown in **Figure 3.11**. The elevation of the boundary road / dyke will meet the flood level at 10-year ARI (EL.14.00 m). No river bank / embankment works will be done.

In addition to that, to minimize the ground water use there will be rainwater harvesting ponds at different locations which will be used for PV module washing.

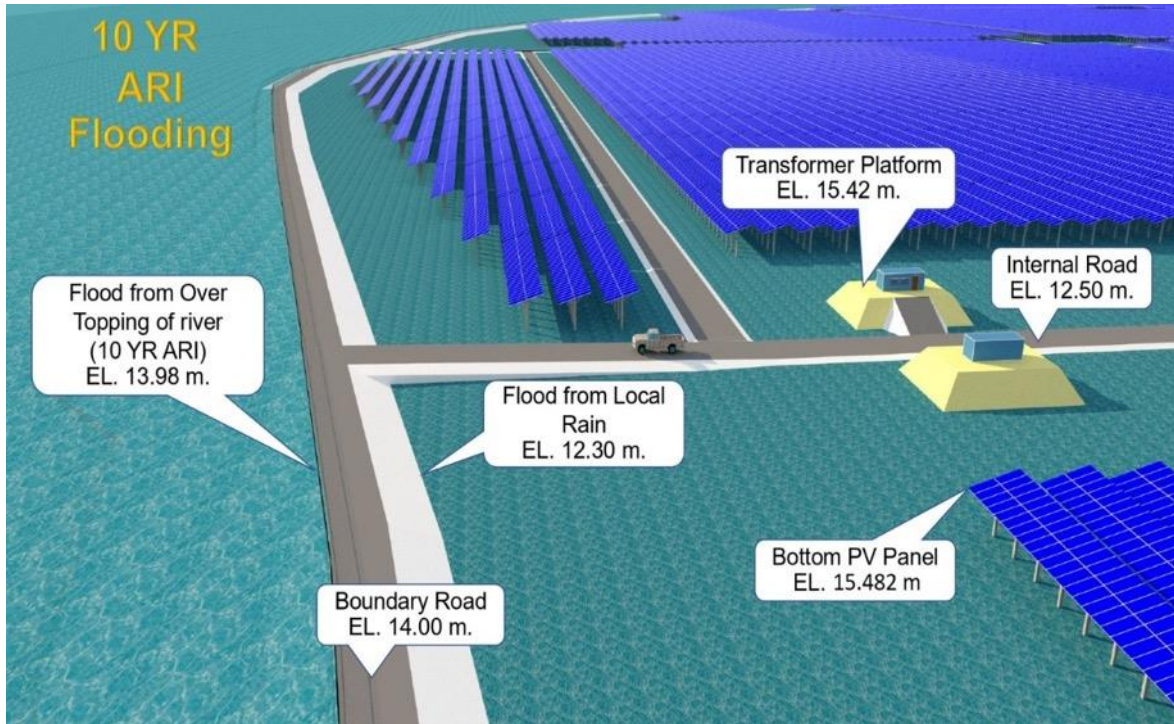


Figure 3.11: 3D view of 10-year ARI Flooding

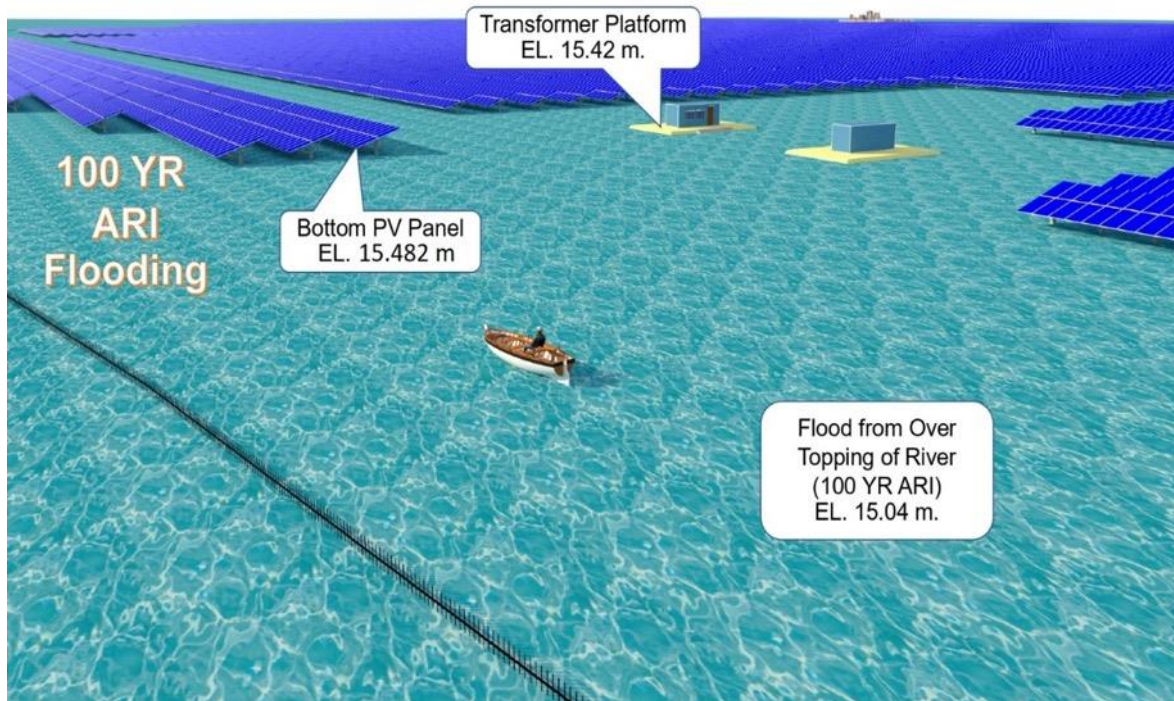


Figure 3.12: 3D view of 100 years ARI Flooding

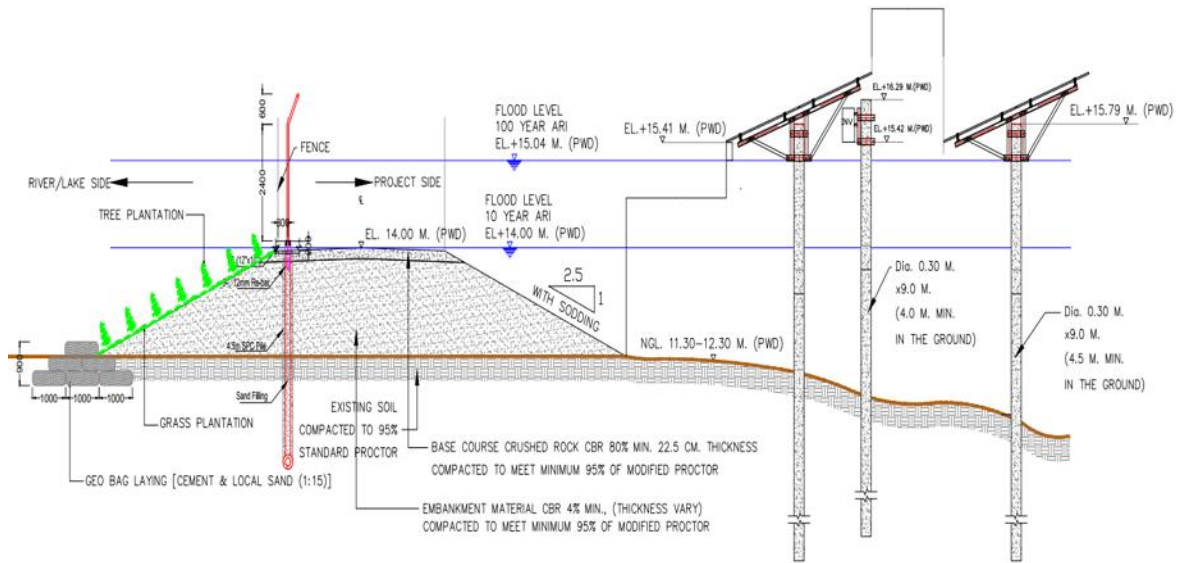


Figure 3.13: Details of Dyke and PV Panel Mounting

3.8.2 Ground Water Management

The project proponent is going to install 7 rain water harvesting ponds to minimize the usage of ground water. Capacity of each rainwater harvesting pond will be 3250 m³. They will reserve 22750 m³ of water for PV panel cleaning whereas the requirement will be only 2742 m³/month. In addition to that there will be water collection system to collect PV panel washing water for further use in irrigation. No chemicals will be used for PV panel cleaning. Details of rainwater harvesting pond is shown below.

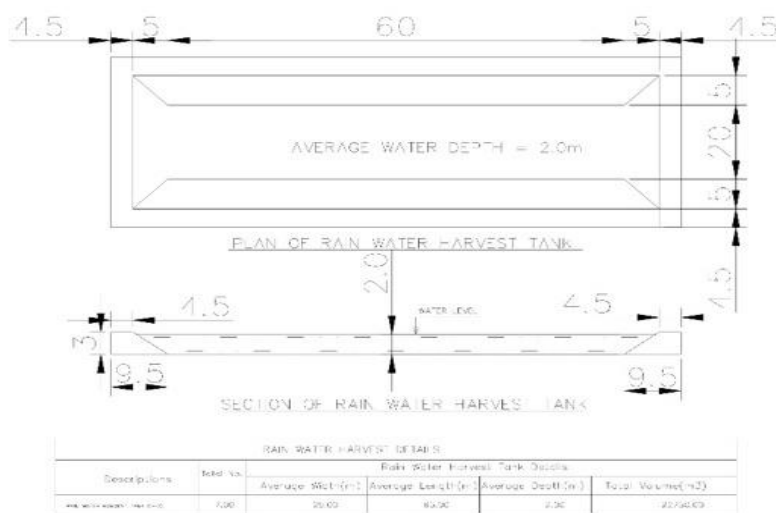


Figure 3.14: Details of Rainwater Harvesting Ponds

3.8.3 Agricultural Enhancement

The project is designed as such so that the land beneath the PV panels can be used for crop cultivation which will enhance the land use opportunity where electricity and crops will be generated all together. It is still to be concluded how and if this can be undertaken, and the specific details and planning are out of scope of this assessment.

3.8.4 Enhancement of Employment Opportunity

The proponent intends to engage local people (at least 30%) in project related activity at all stages. In addition to that, local people will be also be employed for crop cultivation work during the project operation beneath the PV panel area.

3.8 Project Schedule

The project schedule and implementation status has been shown below.

Table 3.9: Implementation Plan of Remaining Works of Main Plant Construction

SL	Sub-Segment of Project	Total Qty./Work Volume	Work Plan	
			Start Date	End Date
1	Foundation Work for 132kVAIS Switchyard	3.0 Acres	01-Apr-23	30-Aug-23
2	INSTALLATION of MMS(Module Mounting Structure)	4728 tables	01-Jun-23	30-Nov-23
3	PV MODULE INSTALLATION	274224 Nos.	01-Sep-23	15-Dec-23
4	DC Cable laying	1300km	01-Jun-23	30-Oct-23
5	Mesh Earthing & LPS Installation in PV Area	350km	01-Jun-23	30-Nov-23
6	INSTALLATION OF 33kV SUBSTATION & SWITCHGEAR PANEL	31 Nos.	01-Oct-23	30-Nov-23
7	INSTALLATION OF INVERTERS	744 Nos.	01-Oct-23	15-Dec-23
8	PILE CAP CASTING OF Transmission Line Towers	79Nos.	15-Apr-23	31-Jul-23
9	TOWERS & H-POLES ERECTION	79Nos.	01-Aug-23	30-Nov-23
10	STRINGING Work OF 132kV double Circuit Line	21km	01-Oct-23	30-Nov-23
11	132kV Underground Line inside PGCB Substation Area	0.5km	01-Jul-23	1-Oct-23
12	Construction & Erection Work for 132kV Feeder Bay Extension	Double Ckt	01-Sep-23	30-Nov-23
13	33kV Underground Line inside Main Plant Area	86km	01-Jul-23	30-Nov-23
14	Erection, Testing & Commissioning Work for 132kV AIS Switchgear, and POWER TRANSFORMER	Double Ckt	01-Sep-23	30-Nov-23
15	110Vdc Battery Banks and Charger Set	2 Set	01-Sep-23	30-Nov-23
16	Erection, Testing & Commissioning Work for 33kV GIS Switchgear Panel	43 Sets	01-Sep-23	30-Nov-23
17	Erection, Testing & Commissioning Work for 33kV RMU & 33/0.415kV Transformers	31 Sets	01-Sep-23	30-Nov-23
18	SCADA & PPC [Erection, Testing & Commissioning]	1 Lot	01-Sep-23	15-Dec-23

SL	Sub-Segment of Project	Total Qty./Work Volume	Work Plan	
			Start Date	End Date
19	Weather Station [Erection, Testing & Commissioning]	16 Nos.	01-Sep-23	15-Dec-23
20	Fire Protection System [Erection, Testing & Commissioning]	Full Package	01-Sep-23	15-Dec-23
21	Plant Illumination System [Erection, Testing & Commissioning]	Full Package	01-Jun-23	30-Nov-23
22	Construction of Plant Internal Road & Boundary road/dyke	Full Package	02-May-23	30-Nov-23
23	Testing & Pre-commissioning Work for All the System before Back Charging of the Sub-Station	Full Package	01-Dec-23	15-Dec-23
24	RRT	Job	23-Dec-23	31-Dec-23
25	CoD	Job	31-Dec-23	31-Dec-23

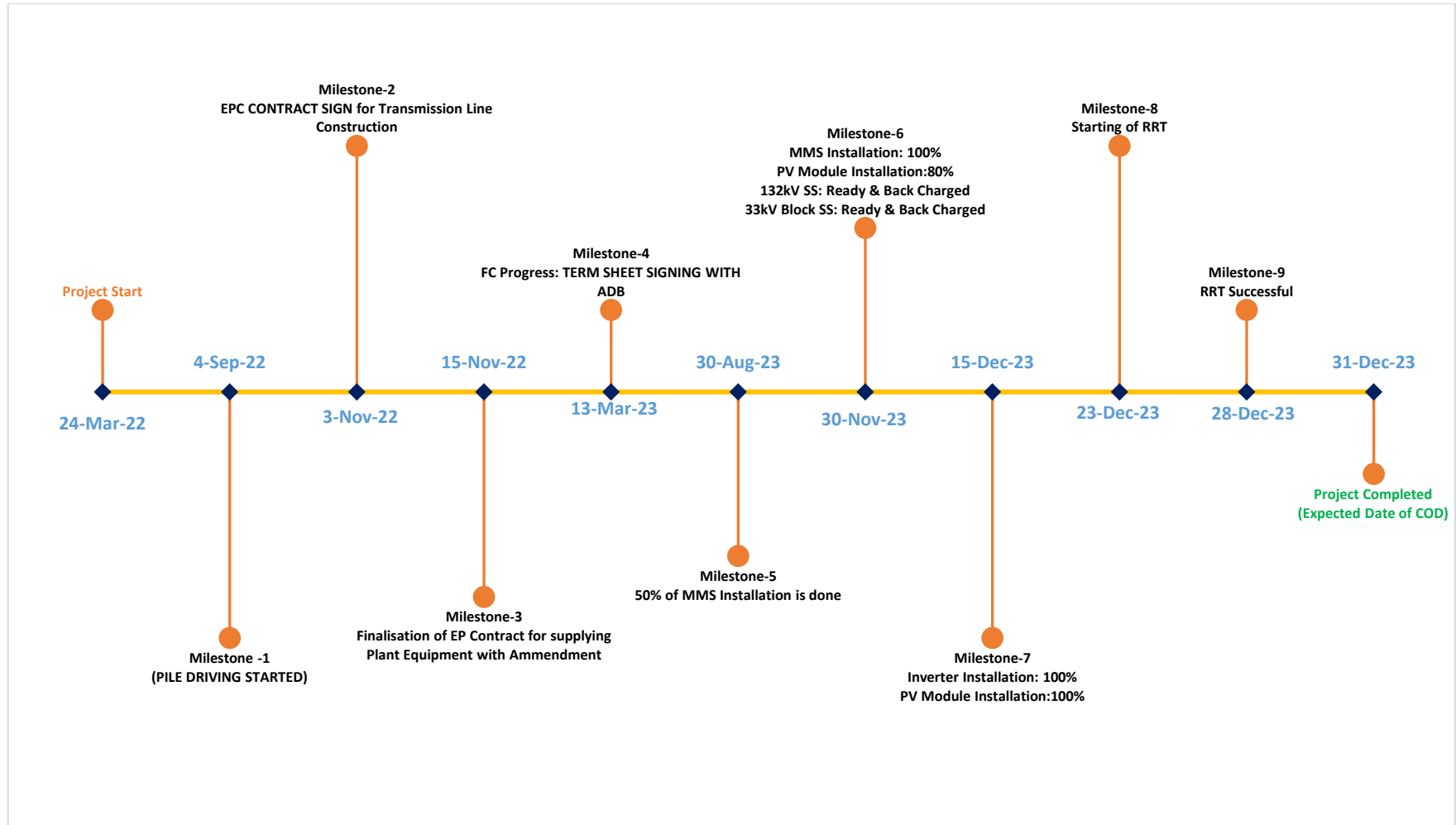


Figure 3.15: Work schedule for completion of the proposed project